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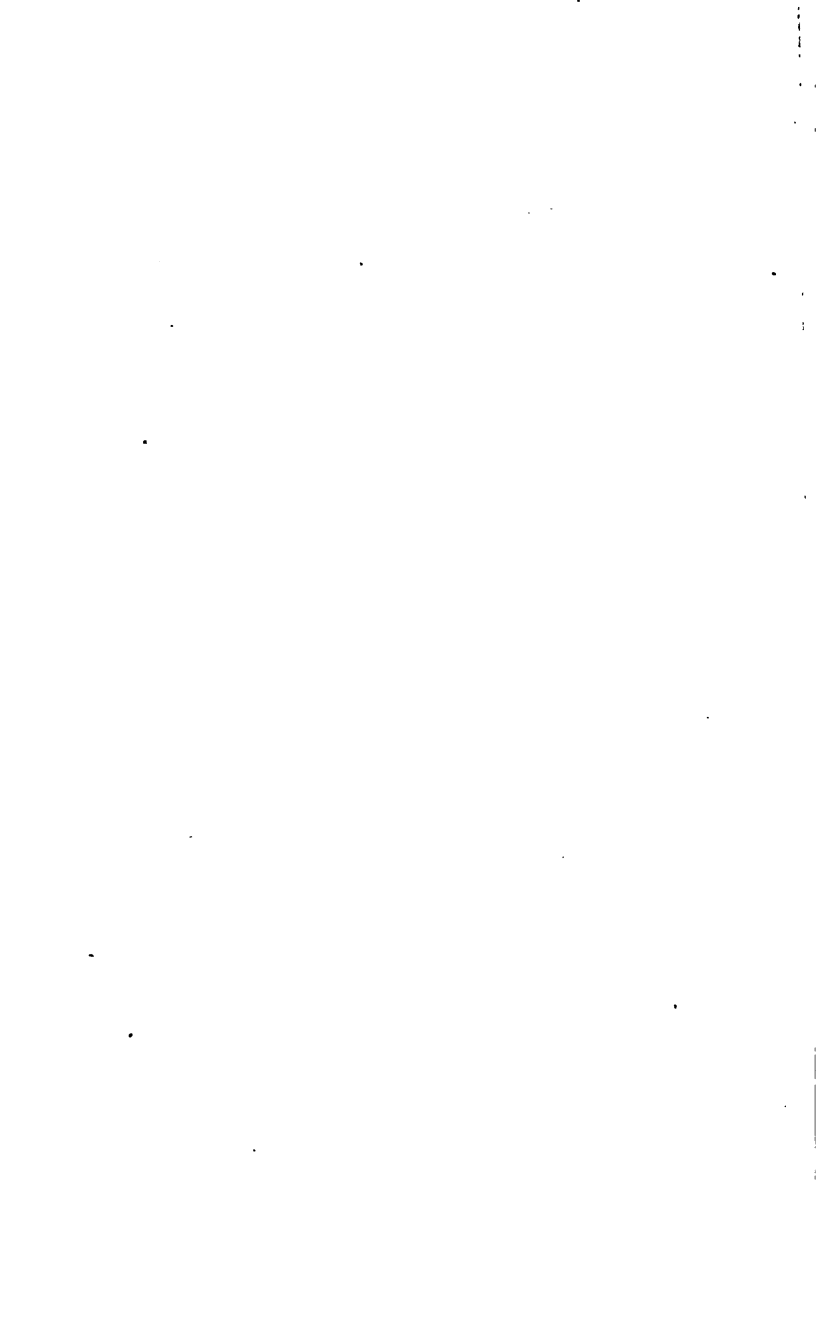
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MANAGEMENT

The Principles which Underlie
Modern Industrial Administration

Being the Sixth Unit
of a Course in Modern
Production Methods

BUSINESS TRAINING CORPORATION
NEW YORK CITY

~~613 vol II~~
HARVARD UNIVERSITY
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Course in Modern Production Methods

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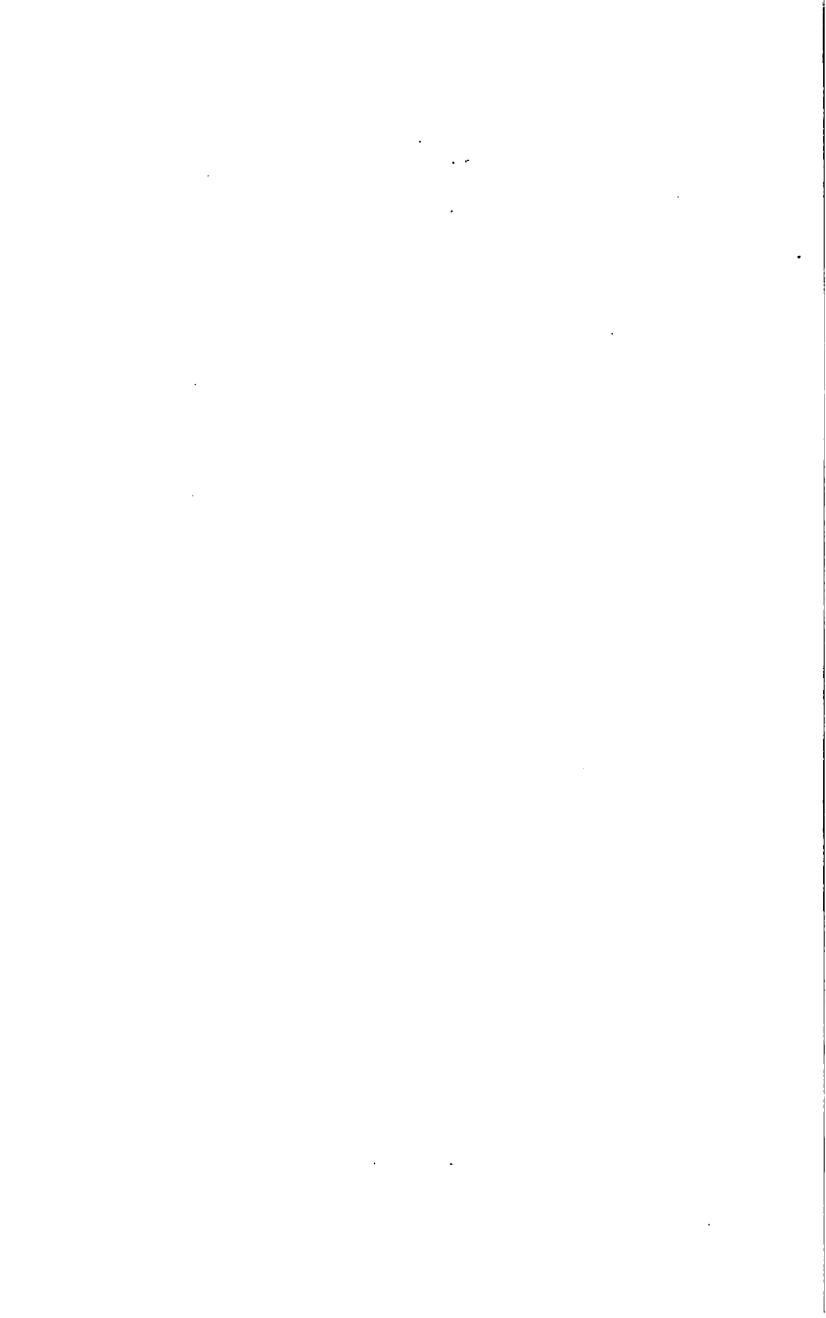
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**The text of the Course is issued in six
units as follows:**

- I. Teamwork**
 - II. Handling Men**
 - III. Organization**
 - IV. Machinery and Materials**
 - V. Production Records**
 - VI. Management**
-

**BUSINESS TRAINING CORPORATION
NEW YORK CITY**



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Putting Management Into Practise

MANAGEMENT is a universal function wherever a man is set in authority over his fellows—one that must be exercised by every executive in every department of business, if he would succeed. It calls for direction and control of people and of the things they handle.

It is not only the head of the plant who must be a good manager. The foreman of the department, the supervisor of men at the machine or bench, the executive in the stock room or in the purchasing department, even the janitor of the building with control over service employees, must manage his work if he would get it done most efficiently—that is to say, most productively. Every employee in turn, if he is to make the most of his abilities, must consciously organize himself for the task in hand.

This Unit treats of the fundamentals of industrial management as they have been developed through long years of experience in production work. They are the principles upon which the successful factory manager works—whether his factory be big or little, and whatever the type of its production. But no man or woman in the Course should consider that these principles are to be studied simply as preparation for possible future use. They can be used now. In the home, in your workshop or office, in your daily life, system can be applied, organization can be made effective, the rules of good management can be practised. By such practise one acquires facility in management and prepares for the big executive jobs higher up.

I

Handling the Team

MANAGEMENT, as treated in this Unit, embraces in combination and in action all the elements already set forth in the Course; including the special relation of the foremen to the general officers and some account of their reactions upon one another and upon their employees.

To the man in the street, Management signifies merely mysteries surrounding the actions of the man higher up, which he has no desire to penetrate.

To the man in the plant, the term often implies a person whom he does not know and rarely sees, who issues signed orders of which the workman never wholly approves and toward the originator of which the employee has sometimes the attitude of the Irishman whose political creed was summed up in four words, "I'm agin the Government."

This tacit opposition would in many cases disappear if our foremen were better informed

and used their opportunities wisely for the common good. A Course in Modern Production Methods should not fail to explain that Management is really the keystone of our industrial structure, which has been so fully detailed in the five preceding Units.

Management determines the general character and supplies a great impetus to all executive performances right down the line, and no amount of clever scheming with forms and charts and system will make up for poor management.

Men attach themselves warmly to *men*, not to things or systems. Belief in systems very largely rests—especially among the under executives, such as foremen, supervisors and inspectors—not so much upon the systems as upon the confidence their authors and recommenders have built up

*The Difference
between Real
Management and
"System"*

by their conduct and daily reactions in the plant; though well-planned systems enormously extend the amount of work an able manager can perform.

Individually and collectively, in spite of the fullest knowledge of "how" to do a thing and correct understanding of "why" it should be done, men naturally love to be led by a warm-blooded, brainy and resourceful man who is manifestly more diligent than the best

of them. No system of doing things can ever accomplish alone what can be done under inspirational leadership, and not a few promising and meritorious schemes have failed because they were not *led* to victory. That is why the entrance of Charles M. Schwab put shipbuilding production on the map, and that is also why some other war necessities lagged behind. A great new industrial army without an adequate force of leaders and brainy planners and executors was the explanation of our exasperating war industry failures at the outset, rather than labor shortage. The bright spots were just those where men who knew "how" and had "delivered the goods" already were on the job. It mattered little what their titles were or whether they wore uniforms—two things alone counted: "Were they equal to the task?" and "Did they have the authority to use their talents to the full?"

Frequently our war-muddling took care that even good managers had not that authority but, wherever these two conditions were met, competent, successful civilians got just as fine results in war as they have done in peace; and some of them even broke their records, despite the strain of bureaucratic delays which seem to be a necessary evil in war times.

We have known men in industry again and again voluntarily to tackle and complete disagreeable or difficult jobs, solely out of attachment and loyalty to a general manager or to a boss much further down the line—men who would not have responded at all to a money inducement alone. A manager in many ways is just like a foreman; he gets his job by proved ability and prolonged discipline at which many a workman would kick vigorously; but he can hold it only by his character. He must live by the impressions he makes, not on past performances. This is true of every class of executive. In any well-managed industry or business nothing is ever finally settled till it is settled *right*.

When Character Enters In

The students of this Course are now ready to consider with profit to themselves the topics of (1) organization, (2) direction and control, (3) system, and (4) problems of personnel and betterment as they affect the plant or industry as a *whole* and the executives as a *body*. They are to view the forest for once apart from the trees, and realize more effectively the place and related purpose of their own executive effort or of the job which they are now preparing themselves to fill.

Earlier Units of the Course have discussed

various phases of each of these subjects. Before we proceed to the final treatment let us consider simple definitions of the four fundamental topics. These definitions will at once review the material already mastered, and lay a groundwork for the succeeding chapters of this Unit. *Four Basic Topics*

ORGANIZATION is the art of judiciously selecting and effectively uniting the working forces of an enterprise; particularly the executives of all grades, from those originating the highest policies down to the smallest foremanship.

MANAGEMENT is the art of controlling and directing daily such an organization and its policies.

SYSTEM is the formulated government of the management. It is nothing more or less, at its best, than organized common-sense applied to every detail where formulation and stereotyped method are economically justified. Wherever they will not pass this test, they are redundant and, however beautifully dressed, are no longer common-sense but nonsense. We *organize* in order to *manage*, and we *manage* through *system*.

SAFETY, HYGIENE AND BETTERMENT arise out of the study of plant, personnel and the human factors in Management. They demand the close attention of the earnest student

of this Course. In the welter of pressing mechanical routine, to forget or ignore the fact that the best instruments of production in our shops are human beings, instinct with feeling, capable of self-determination and liable to serious depreciation, is to throw away the best tool of management in your sphere, whether large or small, and to make distinguished success in your work impossible.

Keep in mind, in your study of this Unit and in all your practical application of the Course to your daily work, these four simple definitions. They will help you, not only to understand the full teaching of the Course, but also to translate your understanding into definite industrial success.

II

Selecting the Team

MANY workmen and some foremen have an idea that, like Topsy, organizations had no creator; they "jest growed."

To amplify somewhat the definition given in the preceding chapter, we may say that *organization is the art of selecting and uniting the working forces of an enterprise so as to promise the most satisfactory composite result.* Despite the assertions of some business specialists, it is never an ideal result, because of the variables in the human factors; because we have to use "folks," not angels or machines. Nevertheless, these folks are, happily, capable of development under skilled guidance and analysis of their aptitudes.

Now organization is not something which can be dispensed with. It is a business and industrial necessity. You may organize poorly or well, but organize you must; and it is esteemed more highly the more suc-

successful a man or institution is. Andrew Carnegie once declared that he might be stripped of his wealth, and even of his plants, but that he'd have to be reckoned with soon again, if only he could retain his organization; so full a confidence did a great captain of industry place in proved people and policies, rather than in mere things.

*Organization
is an Economic
Necessity*

Organization is not peculiar to industry and business, though it is most written about in that connection. Everywhere it underlies the effective control of the joint efforts of human beings, and it is notably evident in the life history of many lower animals. It is closely allied to sociology, the science of human nature; and their intimate connection should always be borne in mind.

Organization, in a word, deals with men rather than with things. Its history in any country, in business and industry, including production, transportation and commerce, is really the story of the development of a people.

Modern industrial enterprises and corporations were evolving and passing through organization changes of great importance when the war absorbed our national energies; and neither they nor our national government will ever be quite the same again. In many things

they will have taken the stride of a generation in several years, and you will have to reckon with the result all the rest of your life.

To do so successfully you must first *understand* it.

Let there be no doubt in your mind as to *why* we organize with the greatest care and bring the ripest wisdom to bear on the process. It is to produce wealth with the minimum expenditure of capital and effort. It is always easier to expend than to acquire, to dissipate wealth rather than to add to it by saving. It is because of this that so few co-operative movements in industry have been a success—the partners as a body were not willing to save capital for future use. They wanted to “cash in” at once on their efforts rather than to build up the organization. It is this unwillingness to make personal sacrifices and a refusal to recognize the indispensable ability of management, rather than any inherent difficulty, that has made the production of wealth and commodities on socialistic lines an impracticable dream. It is well illustrated by the answer of the Irishman who, taking a friend to task for not supporting a certain political ticket giving most attractive promises, was himself trapped by some questions.

*Organization
Demands True
Democracy*

"Pat," said the friend, "if yez had two cows, wud yez giv me wan?"

"I wud."

"And if yez had two pigs, wud yez give me wan?"

"I sure wud."

"Now, Pat, if yez had two goats, wud yez giv me wan?"

"I wud *not*, kaze I've *got* two goats."

The world is full of people who are very willing to give away the half of anything they do not possess, but it is no better off for that cheap sentiment. Men at bottom, however, love to be challenged to endeavor and to achievement and the fact is that there can be no real democracy in business or industry unless true knowledge and clear and unselfish thinking are at the root of it; unless the units which compose it are educated to a point where not only personal interests, but the interests of the whole can be calmly considered.

The trouble makers in industry are chiefly those who refuse to recognize that there is any whole body to be reckoned with, and such extremists are to be found in every grade of employment and amongst owners as well.

The business problem which every organization must solve—and must submit to be measured by, irrespective of its methods and

systems, however attractive these may be—is so to limit expenditure that a satisfactory margin of wealth may be preserved. And this requires the most effective teamwork, not only on the part of the officers of the enterprise but also of those who form the rank and file of the industrial army; and particularly of those executives nearest to the workman.

Officers in industry not only have to operate plants and undertakings economically, but they must also anticipate business fluctuations, measure up with scrupulous care

the prospective value and desirability of extensions, check mere bigness of project, and make

*The Man
Must First
Organize Himself*

reasonable provision for seeing that the organization does not eat its head off in times of depression. But what they do on a large scale is only what the individual must do. He, too, must organize his efforts if he is to insure success. It is a mistake to suppose that modern business methods, or minds of a higher order, have made the thinking machine of the foreman obsolete. As a matter of fact, if a well-informed foreman will give himself half a chance and stand back far enough to get a good look at his job and his men, he will start in using his gray matter in self-criticism at a pace that would make an imported systematizer apologetic if he were

facing the same task and had nothing else to do.

First he must have clearly in his mind what he desires to do.

Next he must determine wisely on the method he will use.

Lastly he must constantly and persistently pursue that method to the end.

If he works on one plan for a time, then changes to another, only to change again and yet again—even to better plans—he will prosper little; for surpluses are profits only when they are earned within a certain limited time.

What is true of individual effort applies even more to the action and reaction of individuals in authority upon one another; that

is, to the success of an organization at work. For, with the organization substituted for the individual, new difficulties arise. An individual suffers

*Group
Organization
More Difficult*

only from his *own* lack of understanding, of judgment, of energy or decision. But when more than one person is concerned, there are the added dangers of misunderstanding, of clashing opinions, of diversity of interests, of insubordination and intrigue.

Organization cannot wholly prevent these things, but it can greatly encourage or limit

them according to its degree of fitness and efficiency.

The question of the centralization of authority is one requiring careful consideration in connection with organization. There are two extremes.

(1) If the subordinate officials are wholly unrestricted in their actions, the interest of the industrial organization or undertaking as a whole is lost to view and harmony of action becomes impossible. (2) *Theory of Organization Plans*
If, on the other hand, all power of initiative is placed in the hands of a central authority, he is so flooded with detail that great delay is caused, and through inability to study varying conditions which arise, general rules are applied to special cases with such rigidity as to cause much loss. Under such a scheme, the emergencies which arise in every undertaking are handled in a feeble, ineffective fashion and a disastrous breakdown of the organization is sure, sooner or later, to occur.

The degree to which loss will be incurred is of course affected to some extent by the size of the organization, whether it be a railroad system, a large industrial establishment, a group of manufacturing plants, an enterprise of field work engineering, or a single unit of an industry.

There are two main methods of handling the organization problem as a whole, namely, the Divisional and the Departmental plans.

Under the Divisional plan, single plants and enterprises are given a more or less complete organization under a chief executive

*Divisional and
Departmental
Organization*

officer, who is held entirely responsible for results and who organizes his subordinates on the same basis, irrespective of the system used on details. The Departmental plan, on the contrary, provides an officer in charge of all similar departments wherever situated, with sub-officers reporting to him at each place.

In actual practise the Divisional plan of organization is never carried out in its completeness for groups of plants, though single institutions have made records that are famous when built around an inspiring, able personality who was big enough to see that his skill was adequately and permanently transferred to his company's records and to competent minor executives. Motives of economy and varying local conditions sometimes do not permit of sharp separations of work at different places at which a corporation operates. Here we must enter the caution that organization details should be *made to fit the business*. It is very rarely wise to make the

business over to suit a new organization plan.

With the Departmental plan of organization this difficulty disappears but others are created. As a rule, no one department is sufficient unto itself. Some of its work requires the cooperation of other departments. In such a case, when lack of harmony prevails, reference has to be made much further up the line to a common superior than in the Divisional organization, and consequently the chance of investigating into and removing the discord is more remote.

The Divisional organization tends always to develop a more broadly trained man for the higher positions than the Departmental. Such an official (particularly when a young man going through the lower grades of experience) is brought closely in touch with the working of departments other than his own, and usually makes the most of the opportunity. The recommendations and decisions of a Divisional officer are therefore likely to have a wider point of view than those of a Departmental official.

In actual practise, whether in plants, in engineering corps, or in transportation organizations, there is no sharp decision made between the two general plans outlined. It

is usually a question of opinion and choice as to where the Departmental plan shall end and the Divisional shall begin, and there should be no dogmatism on the subject, despite the insistence of advocates of stereotyped systems. Sooner or later in the scale of operations, similar departments become so numerous and so large that in the interests of harmony they must have a common authority to refer to.

The detailed methods of operating an organization within departments and plants cover a wide field and will be considered under "System" in Chapter IV. It may be said here, however, that in a centralized organization the best safeguard against discord in the staff, whatever may be the organization plan, is the eternal vigilance of the chief officer in control.

The trend of much of our present publicity upon the subject of business management is one-sided. It lays too much stress on methods and too little on men. It exhibits too much faith in means and too little in manners. This is largely because too many people without managing responsibilities are now professionally interested in magnifying the mere machinery of business.

Both groups of factors require due consideration, but the human ones should have precedence. The primary object of organization

is to bring brainy men together for work and action. A wise organization seeks and encourages men of ambition. It believes that the ambitious man is not necessarily dangerous. It knows that success demands an aggregation of strong individualities, free to contribute their quota, but loyally subordinating their individual preferences to the general policy once declared.

*The Leader
in Organi-
zation*

In order that its work may be well done, and its action strong and forcible, the organization must move forward as a harmonious unit. Herein lies the task and the genius of the leader, the organizer of men as distinguished from the systematizer of things. Both are needed and it is always a happy circumstance when the qualities are combined in one man.

When a competent leader for the enterprise is secured and the general organization plan has been decided upon, we have to consider in the next place the principles on which the leader will handle the staff which he selects.

Two questions at once present themselves for solution: (1) What is to be the relation of each individual to those about him? (2) What are to be the extent and limitations of each man's duties and authority? On the nature of the answers to these questions de-

pendes much of the future success or failure of the enterprise.

Human nature must be kept in mind here. The secret of success is so to arrange the units of authority that they shall act as one person while still contributing fully the knowledge and experience of all.

The principles followed in good organizations are these:

1. *An executive with deciding powers is provided at all points where action must be taken.* Failure to do this opens up the way

*Principles for
Selecting and
Ruling the Team*

for vacillation, jealousy, inefficient compromise and disorder. Responsibility divided invites evasion. Your shop jury should never be able to hold an inquiry over an industrial corpse or plant failure and bring in a verdict of "murder against some person or persons unknown."

2. *The responsibility of each position is fully and carefully outlined.* A simple chart is often useful in conveying such relations to others and helps to avoid the conflict and lack of cooperation which uncertainty creates. It may take many forms but the chart should not be complicated by showing too much detail. It should be readily understood by any employee. Fig. 8, page 122 shows the organization of a typewriter factory which sends

its products all over the world. The numerals in brackets under each division or subdivision indicate the number of employees. Fig. 9, page 130 shows the very different organization of a naval aircraft plant with only one customer, the United States Government, and with no relations to external business except that involved in the purchase of materials and the securing of transportation. Both are very successful, each using the organization form best suited to its business and also to the people available in each district for executive work and shop labor. The first plant had a nucleus of mechanics born and bred to the business and hundreds of women and young people quite new to it; while the second plant—buildings, equipment and personnel—was a mushroom growth of a single half-year, employing fishermen, housebuilders, and non-descript handy men chiefly, only the foremen and a few workmen having previous acquaintance with the arts employed.

3. *The duties of the various organization positions are made to conform satisfactorily to the ability of those chosen to fill them.* This is a most important and often, in reorganization work, a delicate matter with which no influence or special interest should be allowed to interfere. Sometimes those holding the positions must be changed to attain the end

desired. At other times it may be necessary to change the organization. Conformity to this condition must, however, be obtained one way or another, and it is the virtue of a reasonable system that it seldom needs to throw away a good man. Experts are sometimes wholly devoid of executive ability and yet may make excellent advisory members of the staff. The surest way to reduce, or even to kill the good will of an organization is to stab it in the back by favoring obvious incompetence by the men at the top or by tolerating unjust discrimination by those lower down.

4. *No person is made subordinate to two or more others, if it can be avoided.* This is a frequent source of trouble, ill will and inefficiency, and an inexcusably foolish arrangement.

5. *The power to discipline men in any department is allowed to rest in the hands of the official who is held responsible for results.* All appeals to the higher motives of subordinates are strengthened, not weakened, when they are made by the authority having the power of reward or of punishment. This does not mean that there is no court of appeal but it does mean that idle tales and snap judgments are not encouraged by the court.

6. *The duties of the members of the organization are distributed so that unequal loading*

is avoided. This is necessary in order to make fair comparisons of results. It also keeps the keen worker in the prime of condition and prevents the naturally indolent, though gifted, man from growing rusty or flabby.

7. *Wherever possible, no positions on the staff are created which are blind alleys for the ambitious and permit of no promotion therefrom.* This cannot always be obtained, but unless it is generally secured, even good men lose interest in their work and become inefficient.

III

Planning for the Team

MANAGEMENT embraces the two principal functions of *control* and *direction*. Whenever a business gets too large for its owner to operate it—and it must be noted that shrewd business men originate not a few things they cannot themselves operate creditably on a large scale—he seeks for a general manager upon whom falls the burden and all the detail of getting results. When the business is a manufacturing industry, and particularly when it deals with metal products of great precision, such a manager has to possess a very broad and lengthy professional experience, as well as executive ability of a high order and a genial personality, to attain success in the new order of industry demanded in the twentieth century.

As a rule, such a man is not born to the purple. Though there are some exceptions, he is usually made by a lengthy discipline.

No one can handle the man in the shop with the best results who does not know how that man thinks, what his work and trials are, and his ambitions and hopes and fears. Generally he gets such knowledge through experience.

The business of this Course, however, is not to dwell unduly upon the manager. He has "arrived" and we are chiefly concerned in showing how far his problem lines up with those of under-executives and foremen and how it is related to them.

As in every kind of work, it takes certain natural qualities of mind to make a good judge of human values. The manager must be such a person with a wide experience and acquaintance with different types of mind, able to detect them readily, appraise them and place them where they can function most effectively on other minds and things. Prejudice, personal bias, the unjudicial mind are all fatal barriers in management.

*Personality in
Management*

The man who cheats himself, who will not see what he does not wish to see, who instinctively avoids the disagreeable and the troublesome things of business and daily contacts, will never possess the truth about them. Without the truth, however able he may be, he is like a ship without a compass; he may

sail on many seas but he will never get to port.

Character in Management When such a man in the highest position has been displaced by a man of the right sort, labor troubles have evaporated, hard problems of long standing have been conscientiously studied and then solved, harmony has replaced discord in the organization, and quantity and quality of production have improved. These are results that would have taken years to attain beginning at the bottom instead of at the top, and they are brought about by placing a man in power who can use other men to the highest advantage, utterly forgetting himself, and who can rejoice to see them steadily climb the ladder of advancement.

The same characteristics that fit a manager to choose wisely and govern well, apply to all executives down the line in authority over people and responsible for things.

Consider the reaction of the manager's mind upon his policies external and internal. Efficiency here is the result of (1) the interplay of his experience (2) his draft upon the experience of others, and (3) his effective thinking upon these and the facts of the immediate problem before him.

By these three roads he reaches preparedness for any emergency, his mind working the

more easily the oftener it is challenged for solutions of difficulties—or anticipated difficulties.

Such preparedness, however, in the matter of inceptions—by which is meant *wholly new departures in policy and project*—cannot always be measured by the result of the project. For here many other elements enter into performance and enhance or nullify the original conception.

Consider first the nature of the mental processes that lead to the initiative and originality characteristic of preparedness in business and industry alike. The thorough cooperation of the three things named *Originating New Plans* and the quality of the minds engaged are the sole factors conditioning the birth of new business ideas. Mental grasp and imaginative power exercised upon the real facts of the problem are paramount here.

If the inception of a policy or plan is insufficient or inaccurate, and therefore *inefficient*, it matters little what may be done later by good organization and operation to support it. The best thing that can happen to the many inefficient inceptions is that they should never see the light or that they should be submitted to the test of intelligent and fearless criticism.

Unfortunately, many of them reach the rank and file in business with executive indorsement, if not also with executive origination, and are *not* open to challenge. Thereby hang not a few sad tales about rainbow chasing. Actual business and plant occurrences show that lack of thought, lack of imitation and observation, and lack of knowledge of scientific and industrial principles are to be found in men who have inceptions of the highest importance in their control. Good business is the art of selecting probabilities and poor business is the result of taking chances on merely possibilities.

*Sound Thinking
in Management* Sound concepts, visions, forecasts of coming events or needs, or estimates of conditions by leaders in finance, commerce and industry are fundamentals in business preparedness. Experience shows that those concerns have been most successful and stable where the fewest things, external or internal, "just happened." Lack of preparedness is always rooted in lack of foresight or inaccurate estimates, and we do not know how many bad guesses at the future are made on the average by our professional forecasters, or the men at the mast-head of business. One authority says 10 per cent is the minimum and that 30 per cent more just escape failure. It is quite certain that in our

modern civilization, planning, preparedness and clear thinking are none too prominent. The gambler's chance in this land of promise and of quick recoveries has been all too common; but its days are numbered.

It is very important, therefore, to start right with the elementary ideas of projects. Many of our industrial and business inceptions fail right here, though, unfortunately, the failure is sometimes concealed from the onlooker until capital has been hopelessly wasted upon the project, and then various more obvious but secondary reasons are advanced for the collapse.

In the matter of the inception of great business ideas and of useful and more modest shop improvements, the lack of the trained mind in the adult is almost beyond remedy. But even trained minds will fail here if they lack imagination. So far as our experience goes, nearly every good idea in business, embodied finally in a project, arose from trained minds carrying thought past all verified phenomena and experience into the realm of intuition. In other words, the step attained by what is really the scientific use of the imagination was a step beyond the last solid ground. Imagination played with and around ideas and ultimately flamed into realization of that which was yet to be proved. All the

great originators testify to this and our ordinary minds operate in the same way. It was thus that Newton took the stupendous leap from a falling apple to a falling moon, and it is a true saying that "science gives us hints only of what by a *higher* method we come to know."

But with our imagination amongst the stars, our feet must be firmly planted on the ground, for we are not dreaming here. We

*The Passion
for Facts* are consciously thinking and so long as we think correctly, we must think of things as they *are*. The state of

mind within us must correspond to the state of things without us whenever a call comes for comparing them. Some people are intellectually dishonest and decline to see what they do not want to see. It is as if a man relished cheating himself at solitaire. In all preparedness, therefore, a passion for facts should rule and we should be willing to go far afield to get all experiences that count.

The mind also should be a nimble one, for immediate decisions may be demanded. But given a clear, clean start, the originator of business and industrial ideas should launch out boldly in mental speculation; open-minded; struggling against preconceptions of ideas and of people; ready to correct imperfect estimates of things and of character and

to welcome any new truth when it has proved its title, despite its impact upon cherished beliefs. It is the possession of this trait that marks out a man for high command and makes people thrust their savings into his hands.

Such thinking and brooding over facts, always fortified by personal experience, keen observation and resourcefulness, is the secret of power and of efficiency in business preparedness. It gives a man the ability to acquire, to marshal, to master ideas and to forge from them a weapon to conquer men, or commerce, or adverse circumstances. Such subjects as the plant in all its details, the search for new markets, the stimulation of old ones, new products, improved merchandise, reduction of the present huge cost of distribution and selling, the influence of tariffs, the present trend of these in our own and foreign countries, the demands of the export customer, his banking needs, not to speak of the purely internal problems of a business, these and a score of others should keep our inception departments working overtime at this momentous epoch in our commercial career, when the shrewdest analysis is necessary to forecast the economic result to each business of the recent waste of men and capital abroad.

In these days, organization is receiving much attention. It can never get too much, but a word of caution is needed. That organization is not necessarily best considered that is represented by the most imposing chart. It is *quality*, not quantity, that counts for most in the executive circle; and the wise selection of the brains of a business is all-important. Not only so, but the task is not done once for all. We do not mean by this that fussy interference every few months with a stabilized staff is desirable; that is simply evidence of incompetence higher up. But men change, or fail to develop; their abilities deteriorate or we make a mistake in our early choice. Hence, for preparedness we must revise from time to time our selections of the human factors in business and always with the sincere desire to take the square peg out of the round hole and put him where he fits.

*Must be Good
Judge of Men
and Performance*

Good direction calls for truer discrimination of suitability than at present and, at the initial stages, more use of the science of character-reading and of the psychology and physiology of business aptitudes in which notable progress has been made in the past five years. The employment department is coming into its own. Under competent ad-

ministration it is no longer a mere laborer's registry. It classifies aptitudes competently and even the higher salaried men are no longer engaged upon chance impressions of their personalities.

Consider policy in relation to the operating departments of business. The new leaven which has been fermenting in business in the last ten years has worked chiefly in industry. Management has been struggling from an art toward a science. While it has not yet attained that goal, the machinery of management, namely, system, has been evolving rapidly. Whether too rapidly or too completely we will not inquire here. The question before us is: What is the essence of preparedness and good policy in the operating department? in its mills and plants and stores? in sales and distribution of products? and in the office, clerical and recording functions of all of these?

The essence of modern preparedness is the use of the "scientific method" in attacking problems. Now the scientific method is not any particular system, nor is it a tool that you can keep handy on the shelf for occasional use. It is as old as Socrates and the dawn of science, but in its conscious application to business it is as new as today. It is essentially an attitude of the mind which influences our

business conduct, plans and decisions, and causes us habitually to observe, describe, analyze and classify with accuracy the activities which occur in our daily round.

The result is that we apply these analyses and experiences to regulate later affairs and shape all our records so that they are inter-

*Utility the Sole
Justification
for any System*

pretive and constructive. At the same time all this is confined solely to the problems where it is *economically justified*. Many men of outstanding ability in inception do all of these analyses by mind and memory, but in the operating departments we need store houses for facts and conveyors for our decisions, and the real question of system economy is: What kind and how many? It is the possession of adequate judgment in this matter that distinguishes the mere statistician from the efficient business planner and forecaster.

Finally let us refer to the great importance of preparedness and wise policy in labor management. Do not attend to all else and give the human problem "absent treatment." More and more society in this favored land is becoming just "all-of-us," and the capitalist or executive who does not want to belong is quite unfitted for the new industrial age.

When times are tranquil and relations are

harmonious, get acquainted with your people and let them become acquainted with you.

Let trust and confidence be sown and you will not reap distrust and suspicion. Do not let the sowers of good will be accompanied by a

*Common-sense
Labor
Management*

brass band. Do not attempt to hasten the surrender of the doubter by paternalistic policies which he cannot appreciate. Some one in all our large plants and organizations should be charged with this sort of preparedness: the sensing of the unspoken but none the less real misconceptions—often grotesque—the grievances and trivial grudges which, massed in time in narrow minds, are formidable obstacles to progress. Every business must meet the impact of troubles of outside as well as inside origin; but, if you know your people and they know you, you will not have to wake up in surprise and chagrin at the number of things you felt comfortably sure of, which turn out to be not so. In this the foremen are scouts who can perform invaluable service.

Here then is the conclusion of the whole matter of modern production preparedness. It is simply the concentration on the inceptions in every department of the shops (and not only in the works manager's office) of the best minds we have, and the provision for

systematically widening, recording and publishing experience. Behind every method, every practise, every custom in business and society alike, lies an idea or group of ideas—a theory—a reason. Hence, the only practical things in life are ideas; the only practical man, the man of ideas—the man who *knows*, not merely the man who does. Behind our individual practise, whether we are conscious of it or not, lies the theory, and only he who knows it possesses the rule of the higher practise and can take the next step wisely.

It is thus, on the last analysis, to the man of sound theory and of efficient mentality we must ever look for preparedness at its best, for better ways of doing the world's work, for progress and efficiency.

IV

Standardized Team Plays

UNITS III, IV and V have described the details of certain methods of tying together various industrial operations which are closely related. Here we consider systems in relation to the whole scheme of things in a plant, and when these are combined in one statement we have the general system of an industry.

The chart illustrated in Fig. 1 represents what is usually embraced in such a statement. It is practically a summary of the tools of management; a dovetailing of all the standardized ways of communicating instructions, recording executive acts, standard methods and production performances. Fig. 2 is an example of an effective and concise numbering and cataloging system for an intricate machine of 3000 parts. Yet its system is so simple as to make the one catalog available for the plant and for six hundred sales offices, with provision for years of expansion and additions without confusion. Fig. 3 illustrates how the main features in processing raw materials from mine and

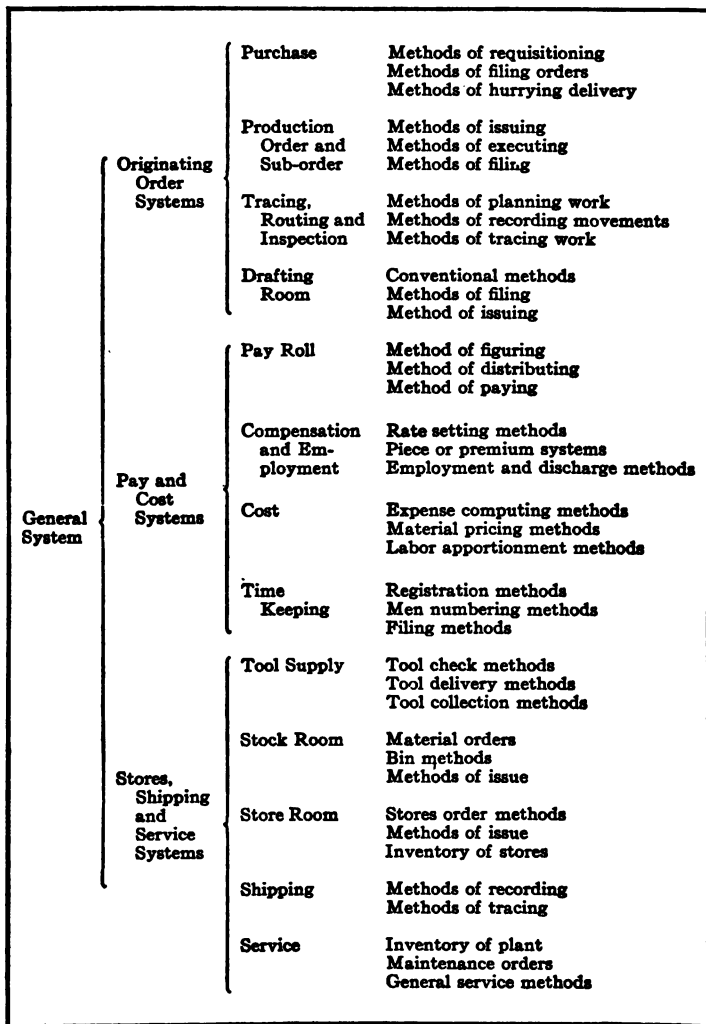


FIG. 1.—Analysis of a General System

SYSTEM OF GROUPING AND NUMBERING

No. 10 with Column Selector is the regular correspondence machine.

No. 11 with Decimal Tabulator is a billing machine.

Letters "A," "B," "C," "D," designate the length of carriage, the writing lines being $7\frac{1}{8}$, $9\frac{1}{2}$, 12 and 16 inches long respectively.

CATALOG NUMBERS

SIMPLE PARTS	COMPOUND PARTS	MACHINE GROUP INCLUDED
10000-11499	11500-11999	Frame (including carriage guide rods)
12000-13499	13500-13999	Keyboard (covering type actuating keys and space key complete with connections).
14000-15499	15550-15999	Type Basket
16000-17499	17500-17999	Shift Mechanism
18000-19499	19500-19999	Main Spring Mechanism
20000-21499	21500-21999	Escapement (including rack, universal bar and connections).
22000-23499	23500-23999	Back Spacer
24000-25499	25500-25999	Release Mechanism and Regulator
26000-27499	27500-27999	Ribbon Movement
28000-29499	29500-29999	Carriage Frame (including carriage scale and margin stop rack).
30000-31499	31500-31999	Cylinder and Cylinder Frame
32000-33499	33500-33999	Paper Feed Mechanism
34000-35499	35500-35999	Line Space Mechanism
36000-37499	37500-37999	Bell Mechanism, Line Lock Mechanism, Margin Stops and Final Stops
38000	49999	
50000-51499	51500-51999	Column Selector
52000-53499	53500-53999	Decimal Tabulator
54000-56499	56500-57999	Extra Attachments
60000-61999	.....	Type
62000-63999	.....	Bushings, Sleeves and Collars
64000-65999	.....	Pins and Rivets
66000-66999	.....	Springs, flat
67000-67999	.....	Springs, coiled
68000-69999	.....	Springs, special
70000-73999	.....	Screws, standard
74000-74999	.....	Screws, special and commercial
75000-87999	.....	Nuts, standard
88000-89999	.....	Nuts, special
90000-90999	.....	Washers, standard
91000	.....	Washers, special

FIG. 2.—A Page from a Manufacturer's Catalog, Showing System of Grouping and Numbering Parts

quarry to iron and steel products may be embraced in a simple chart.

System implies government—formulated government—in business and in industry.

Modern production is for system every time as opposed to the policy of “mud-

*System is
Formulated
Government*

dling through somehow,” but it has no particular affection for red-tape—mere system for system’s sake. At

the start let us have a clear idea of what is meant by system, for the word is used interchangeably by careless thinkers and writers for things which are not its equivalent. We are concerned here only with its business sense where system is “the state or quality of being in order or orderly” and a system is “the connection or manner of connection of parts as related to a whole, or the parts collectively so related; a whole as made up of constitutive parts.”

Where in the business world does system rank? Organization is the primary essential of commerce and industry. Management is the second requisite. System embraces the formulated methods of control evolved out of these. In other words we *organize* in order to *manage* a business undertaking, and we *manage* it through *system*. A system then is simply a standardized way of performing frequently recurring tasks.

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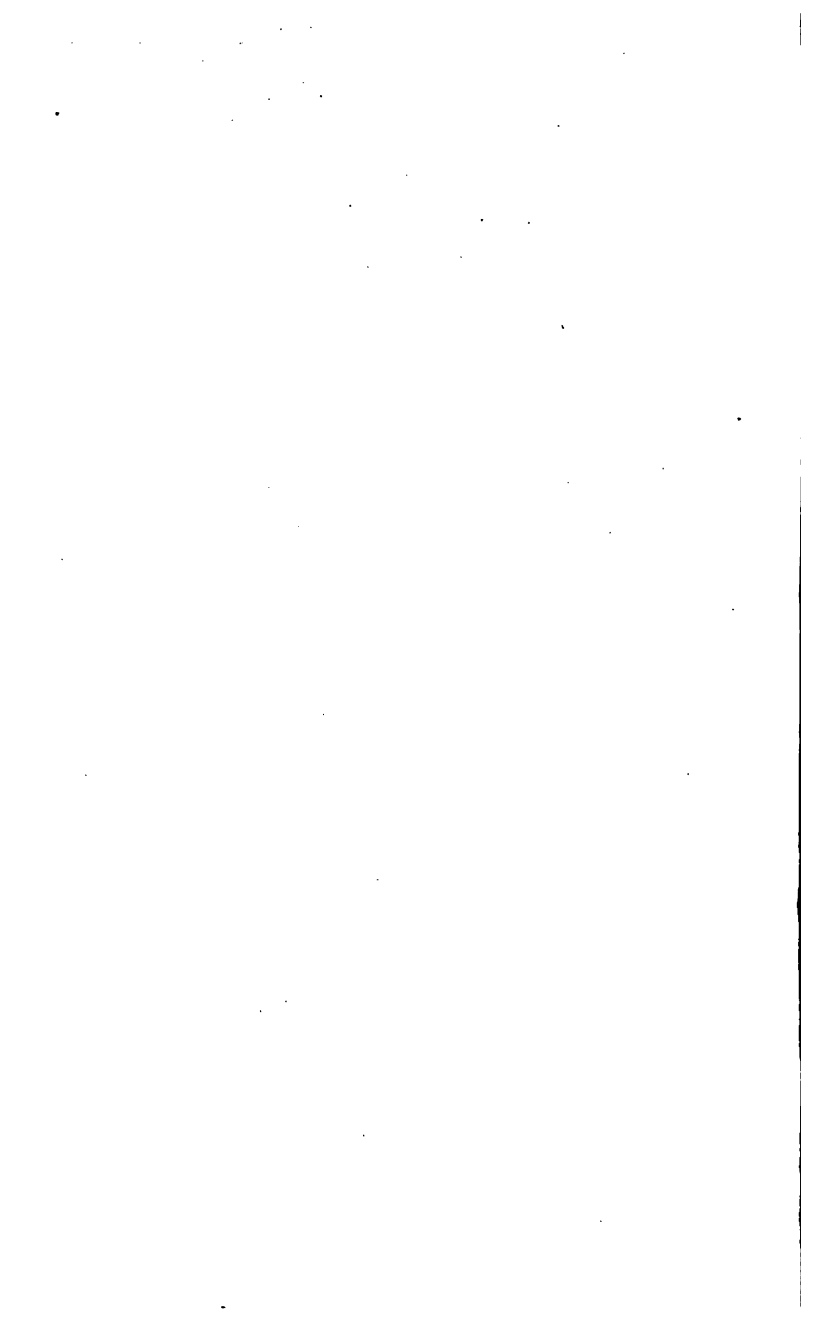
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It is customary to recognize as system only the formulated methods of control, operation and inter-communication—those which have been embodied in the forms and fixed instructions. In many good organizations there are some regular practises which though not formulated are of great importance, particularly those relating to the handling of personnel and fostering of the internal asset of good will among the staff. Nevertheless, in most organizations and under good management, the professed general system will embrace by far the greater part of the operations. It is a weakness in any business if the responsible executives or foremen are unable to give on demand a satisfactory account of how it is *supposed* to work. The man in industry should know these three things:

*Three Essentials
to Good System*

1. Whom he has to cooperate with.
2. What he has to manage.
3. How he is supposed to accomplish the work.

This knowledge, in proportion, should reach down to the performer of the humblest tasks.

We need not here repeat in detail the individual standardized methods, which are just little systems, by which the handling of men, materials and products are facilitated in plants and industries. These have been dealt with in the preceding Units. Nor need we

enter into the temporary or special systems adopted from time to time to further an investigation of the moment; such as a study of lost time in crane or messenger service, of delay due to slow belt repairs or late pay distribution, etc. Such reports need special measures to obtain them, methods or systems which are immediately dropped thereafter and which would not be justified as permanencies. Whenever any temporary system is maintained after its purpose has been served, it is simply useless red-tape and its retention tends to reduce the standing of the general system in the esteem of the force.

It is quite possible today to find businesses excellently organized, but poorly managed and inadequately systematized. On the other hand, a business may have some satisfactory departmental systems due to painstaking efforts of enlightened individuals not in the executive circle, but, through lack of well-defined lines of organization, the net results of operation may be disappointing and the system unsupported.

In other cases a strong capable management is found to atone for not a few sins of omission in system, but the limitations of close supervision by one man, however capable, render this an unsafe condition in an industry. It may be accepted as a general rule that

proper selection and instruction of the human factors in organization and management will lead sooner or later to a systematic or standardized way of doing things which will be a natural outgrowth of the needs of the business, while mere red-tape will always prove ineffective. Such a state of things should be reached sooner rather than later, and consequently must be the object of forethought and deliberate planning.

While taking full use of "the exceptional man," a good system helps to secure the continuity or permanence of a concern's prosperity—though system alone cannot guarantee this.

Whether we realize it or not, we all systematize. In our hours of business, at least, we should systematize consciously. We should know when to begin and where to stop, for system is frequently abused by neglect as well as over-indulgence. System exists for business, not business for system. It is a good servant but a bad master. The principle of due proportion should always govern here. It is both bad business and poor sense to insist that cob-webs of system shall be wound by a specialist about a business, subject to no challenge from the doers of things—the responsible executives. The committee sys-

*Good System
is Deliberately
Adopted*

tem of review of a business will always afford opportunity for interesting comment and at no time should any check be placed upon honest criticism of the things that be.

Always remember that there is no magic about system, no matter whose name may be attached to it. It is no pink pill for pale plants. System is simply organized common-sense. If a system for anything is so involved that its elements cannot be easily understood, have nothing to do with it. A description of all of the operating systems in a large organization is bound to be lengthy but it should not be cloudy. Individual systems, whether for clerical or plant functions, may be extremely simple or they may be more or less elaborate according to the nature of the problems they have to solve, but whether easy or complicated they should always be clear. The desirable system in any case is that which does the work at minimum cost. A system which calls upon you to spend 99 cents in order to save a dollar is a questionable economy.

Set this before you as a rule that no system is worth any more than it can earn: and see that it pays its way. There are systems of doing things in some plants which are most ingenious and interesting and yet undesirable from the point

*Systems Must
Pay Their Way*

of view of profit-making. There are systems constructed in the years of plenty, which eat off their heads in lean times.

When we come to inquire why it is that not a few fairly shrewd people fall victims to excessive systematizing, while others do not seem to be aware whether or not they have any system, and both lose thereby, we are confronted with the history of attempts at coordinated effort in the business world. The attempt nearly always arises out of trouble with product or profit. The first question which the experienced investigator usually puts, to himself at least, after all the facts are on the table, is not "what system did they have or not have?" but "is the business worthwhile anyhow?" This is no idle question. Not a few systematizers have labored valiantly over the plants and made sincere promises of betterment which never came to pass. The reason was that the businesses, irrespective of the system in use, were inherently unprofitable ventures and could have been readily classified as such with a fraction of the energy spent in spinning the web of a new system around them.

*Systems Which Are
Merely Survivals,
Not the Best.*

Many concerns to which the ardent business doctor would like to apply his remedy would be in the same case as the man about whose

noted ill-health a physician remarked, "I cured him." "But," remonstrated a friend, "the man is dead." "Yes," admitted the physician, "but he died cured."

Now the systems of many individual businesses are not the result of any purpose or planning. They acknowledge no parentage and they experience no loving care. They are found to be haphazard aggregates of schemes evolved over periods of years by many individuals who wished them well and passed on. They have been modified, as time passes, but never coordinated. In many cases common-sense has, usually without official knowledge or sanction, got rid of the most undesirable features. And what remains has this sanction at least—it works. In other cases weaknesses have been officially noted and remedied until the systems are established almost beyond question, though nothing definite is known as to their comparative cost and no broad review of the situation has ever been made.

Notwithstanding such conditions, we must frankly recognize the fact that some businesses with such a system history are successful, whether because of their systems or in spite of them we cannot say. This we do know; that many of these relatively simple schemes for getting through the day's work

cost very little and are but a small item in the total expense of doing business. Where the system relates, however, to the routine of an important matter in production or in factory costs, it is by no means negligible and it is most important that wise and experienced heads should determine "how much" and "how far."

On the whole, the tendency has been to over-elaborate detail without regard to its profit-making utility; to construct ornament rather than to ornament construction; to design systems on expensive foundations strong enough to carry a great deal of business that does not exist and never will exist. A decided reaction is now setting in which should not be allowed to go too far.

*The Tendency
Toward System
Excess*

Few people realize on what remarkably small margins many businesses which prosper slowly in normal times are carried. They could not stand the infliction of new, elaborate and costly plans of operation which guarantee no expansion of trade to justify them. When the plan or system has to do with external progress and betterment it is a different matter, but we must still keep ever before us the fact that dividends are not made certain by ultimate profits but by net surpluses within a definite time. Good system work is derived

from three sources. (1) The facts must come from experience; they should never be assumed. (2) Advantage should be taken of other people's solutions. (3) Then both must be subjected to careful reflection if the right judgment is to be arrived at.

*Plant History
Should Be
Respected* We must study each shop problem separately, not forgetting the foreman's situation which of itself may spell success or failure for the best of methods. When we have done this, we will realize that in solving any particular problem we will not get very far by mere imitation, for this involves the imposition of outside rules upon conditions for which they were not framed. To this some enthusiasts will answer, "Well, change the conditions." But this short cut to getting anything done in the precise way to which a given systematizer has become accustomed is often neither necessary nor desirable, and is usually a short-sighted policy. Only an adviser of great experience should take the responsibility of suggesting radically altered conditions in a business where they have become a vital part of its policy, and he should never be allowed to impose them on his own initiative.

But, you may ask, has not industry progressed far in the matter of wisely formulating systems of business operations?

Is there no sure guide to the reasonableness and desirability of proposed courses of action?

In place of more or less uncoordinated routine, have we not been able to develop an orderly sequence which is not extravagant in operation?

Undoubtedly we have gained much ground, particularly in specific details of system, but we have also at times been unable to see things in the large because of these details, and have founded expectations of general betterment and increased profits in business on the proved success of system factors which have *little to do* with determining final results. We have also run into the danger of assuming that certain elements and methods in current system practise have now been justified beyond further argument and need no material modification. It is assumed by not a few professional systematizers that such methods, to their smallest details, may well be stereotyped in general practise.

*Common-sense
Should Rule*

What is the remedy for unwise systematizing?

It is two-fold. First, while holding the chief executive of a business wholly responsible for permitting important changes in system, it is always wise to give his subordinates a chance to offer suggestions. If this

is done the proprietors will be surprised at the number of things they assume about their business which are not so. So long as we think correctly we must think of the things as they are. The state of mind within us must correspond to the state of things without us whenever an opportunity arises for comparing them. In other words a passion for facts should over-ride all other considerations, even our most cherished ideas of system detail. Taking the brains of your business into your confidence may seem a very ordinary precaution but the follies which have been perpetrated for lack of it have done much to injure the legitimate progress of system.

The second aid to correct views in applying system is a sound apprehension of what the scientific method essentially is, and of its limited possibilities and relation to the varying factors of business—which is still an art rather than a science.

By the “scientific method” all repeated experience with men, things and schemes in business and industry is observed, criticised and carefully verified and daily recorded; and, through reflection and reasoning, is made to yield results wherever they are economically justified. The scientific method or principle of verification is as old as Greece

*Sound System
Derived from
Scientific Method*

but was first used extensively in modern science where every "result" or new truth is a welcome and permanent addition to human knowledge. But it must be applied with caution to the business world where its laborious and expensive investigations should be exercised only on frequently recurring things, and even then can only be justified by the economic utility of the "result."

In facing the actual problems of industry, it is not as a rule necessary or advisable to go into minute details before systematizing actively to some extent. A very comprehensive system takes much time and money to formulate, and is rarely secured "made to order." The responsible executive or foreman is called upon to produce as well as to ponder, and if he is wise he will hit the obvious high spots of ineffectiveness and lack of system at relatively low cost without delay, leaving the refinements to a later date and probably postponing some of them indefinitely.

The same considerations apply to the multiplication of records in production, costing and accounting. It is well to be wise *soon* after the fact. If the enlightenment is too long delayed and unnecessarily detailed the cost of procuring it may be out of all proportion to its value. A noted engineering

expert who was retained to investigate a well-known business said that the man who had designed the recording system of the plant must have had a personal interest in some stationery concern. There were so many useless cards and printed forms that he could account for them in no other way.

The wealth of thought and care exhibited in the recording systems of great insurance, railroad, financial and similar institutions is wholly out of place in a plant where many things are *quickly over* and done with and of little future interest to the executives. Everywhere the creator of red-tape must be, at one and the same time, encouraged and challenged if the result is to be effective and permanent.

If the development of system is not to be abused, executives must make sure that the economy of any proposed routine is certain.

*System as a
Good Shop Tool* They must oversee the matter and must insure, before costly formulation is started, that well-considered, broad views of their business situation are taken; that all the facts are on record and the departmental systems properly dovetailed into one another. This can often be assisted materially by preliminary charting of the proposed routine, which brings out misconceptions as to its details.

In no case should proprietors descend to the level of buying so much magic system from a practitioner who vends it and rest content with the unsupervised efforts of a very ordinary system mechanic sent out to erect the job. As time goes on every system should be pruned and pared of extravagances so as to attain maximum economy and despatch. Its cost should be watched carefully and a look-out maintained for suggestions and improvements. It should never be presented to employees as a sacred ark which no one may touch or as a closed intellectual result which may not be questioned. The moment an executive or hired counsel is foolish enough to announce either directly or by implication that all the thinking on system in an establishment will be performed in future by a mind of a higher order, there is much tribulation in store for that mind. Yet, system practitioners have occasionally so cornered the executive authority as to be able to act in this way, and their reign though glorious has been decidedly brief.

It is right to insist that a given routine shall be followed implicitly while it is the prescribed system, but it is wrong to shut the door either deliberately or by accident to proposed amendments by the foreman. Every such action reaches far beyond its apparent

field and the cost of ill-advised conduct of this kind has to be reckoned in large figures.

In this discussion we have avoided mention of that over-worked word and under-worked thing—Efficiency. It can be attained only by

*The Meaning
of Efficiency* the operation of the three wisdom factors already laid down here, and it can not always be proved by figures.

There are other benefits than economy from the judicious systematizing attempted in modern business and industry during the last ten years. Interest is one of them. There is nothing so pleasing to an employee as to stimulate a mental interest in his daily work, and this the wise practise of the scientific method always does.

Modern Production Methods are built through many systems on one solid foundation: "the truth, the whole truth and nothing but the truth" about all the factors animate and inanimate that participate in industry.

When the truth is known and correctly recorded it is a record of experience, and the systematic use of experience, the economic control of effort and the promotion of personal effectiveness are the objects of all worthwhile systems.

V

Methods of Leading the Team

IN any industry, the particular way in which the individuals in the organization are combined and related, determines the type of management.

As pointed out in Chapter II it is quality of supervising ability, rather than the number of executives, which counts most in the sphere of management. Consequently, the particular type of government adopted is sometimes as much determined by the kind of executives available as by the kind of plant they are to handle.

*The Evolution
of Management*

The great bulk of industries grow from small beginnings, in which the proprietor is sometimes the sole executive. In such cases, if he knows the industry thoroughly, is a good selector, teacher and leader of workmen, and has considerable capacity for handling detail rapidly, he may assume the sole responsibility and authority. Such a man must be on the job every minute in a one-officered organization of this description. Such an organization has the advantages of very definite authority and good discipline. Fig. 4 on page 54 shows

the simple line-up required when he finds the task getting beyond his single powers and adds a few well trained foremen. Fig. 5 on page 55 shows this type of *line* or *military management* when expansion calls for subdivision of responsibility by the owner or president both in external and internal relations.

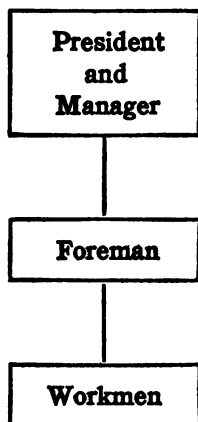


FIG. 4.—Chart of a Small Industry Illustrating Line Management

Nothing can beat this type of direction in economy and dispatch when the line officials are all fully competent for their duties. Line

The Line Type of Management management may adopt and apply the scientific method in industry, and it can provide for understudies to secure continuity in executive ability. Its disadvantages lie in possible slow-transmission of orders and in the necessary repetition of

such as they go down the line. These are not inherent under a good line system, however. The chief disadvantage is the self-limiting of the scheme due to the natural restrictions of the human being. Good line management on a big scale calls for the "superman." He is

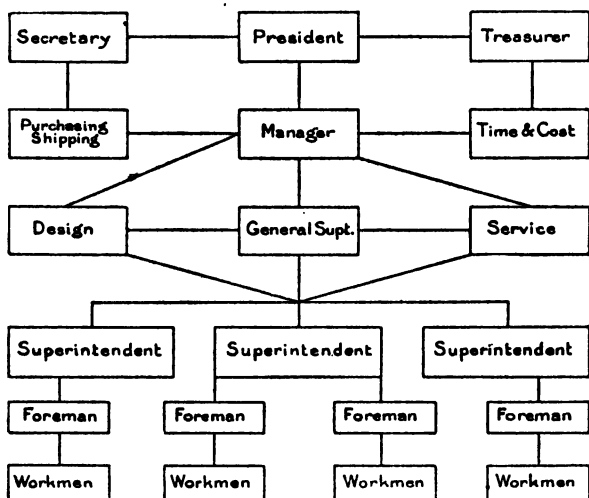


FIG. 5.—A Large Plant of Many Departments Organized According to Line Type of Management

scarce and can guarantee no competent successor.

As a result, departmental control combined with some degree of specializing in supervising functions is the inevitable path of progress in growing industries. The most elaborate specialization amongst industries has been evolved in machine shops where the higher

precision of work demanded has led to much research and profitable division of functions in supervising, instructing and leading the workmen.

The chart illustrated in Fig. 6 on page 57 shows *functional* or *staff management* substituted for the line or military form in the organization charted in Fig. 5. Its

*The Staff Type
of Management*

advantages are that specialists—much narrower in general knowledge than the foreman—may each issue direct and authoritative orders to the individual workman, while the foreman becomes merged in the shop disciplinarian or policeman. In its fullest division of function the staff type of shop government is known as “scientific management”—a development of this type which resulted from the proved gains obtained by the late Frederick W. Taylor in his notable researches into the art of cutting metals.

Attempts to impose the precise detail of the Taylor System upon other and very different industries have not met with uniform success. The theoretical and somewhat arbitrary attitude of scientific management to industry is giving way to respectful attention to the fact that the problems of directing modern production were not solved once for all when a most important and illuminating

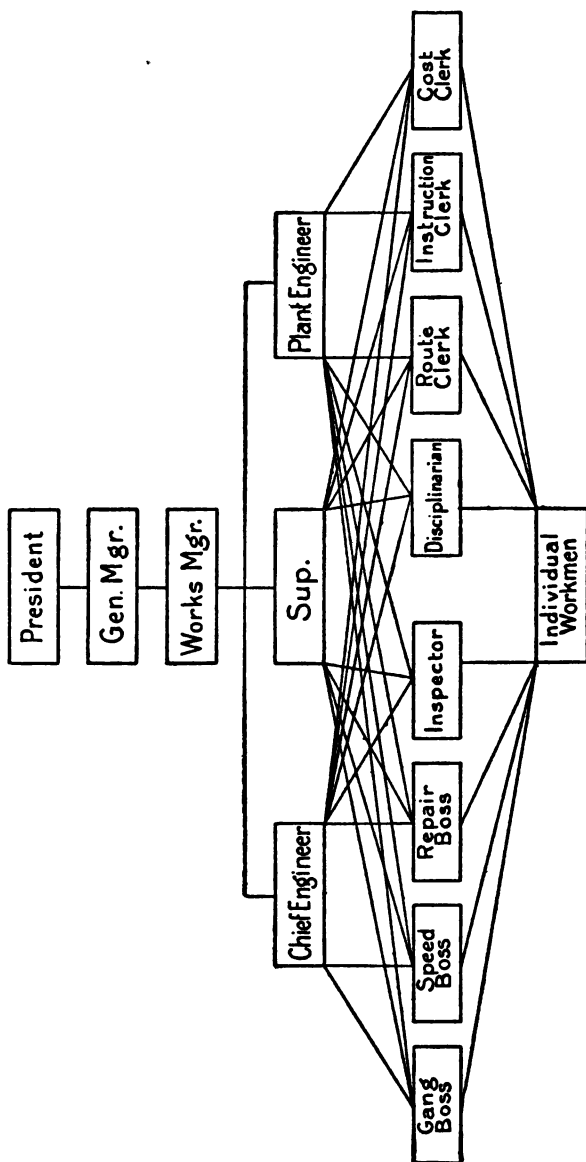


FIG. 6.—CHART OF AN INDUSTRY EMBODYING FUNCTIONAL MANAGEMENT
Foremanship is specialized and the lines of authority cross as illustrated in the diagram

contribution to machine-shop management had been widely published and appreciated.

Modern industry owes a great debt, nevertheless, to the gifted author of scientific management and his followers in the field of business efficiency. By this propaganda he brought a mental stimulus to production managers and their organizations of every type which has come to stay. It has proved beyond any doubt the value of diverse information provided in readily accessible form and recorded as standard practise, the desirability of using specialists to convey this information and enforce its use, and the lightening of the load of the former general burden-bearer, the foreman.

The Taylor System

The proved objections in practise to the Taylor System of full functional management have been chiefly: That it results in (1) friction due to overlapping authority, (2) slackness in discipline with so many partial "bosses," and (3) an irresponsibility for the final results. As we have already shown, the mainspring of all good modern production is the attitude of *mind* in which its problems are attacked, and not so much the precise detail adopted to carry out the chosen plan of organization and management.

The scientific method, which calls for "the truth, the whole truth and nothing but the

truth" about all the policies, materials, processes and people involved in industry, will never fail to produce reactions toward efficiency. Common-sense, however, must be relied upon to see that the means chosen in any instance do not become an end in themselves, but are made to submit at all times to the test of product, profit and harmonious action. The use of any scheme, at any plant, at any time, which applies the resources of science to less definite advantage for the investor than more modern and cheaper methods, is not business—though it may be a very interesting experiment. Good business is the selection of probabilities, and poor business is taking chances on possibilities merely. And industry is *business* first, last and all the time.

The basis of the new view of industry which has brought to pass Modern Production Methods is a radical change in the source of responsibility for progress, and is outlined in the following general principles:

i. Increasing the efficiency of operation is a function of the management and not of the workmen. In other words, if the foremen and workmen maintain the standard of efficiency that has been set for them, they have rightly performed their function—and it should be the duty of some one

*The Theory of
Planning in
Production*

else to develop new and more efficient methods.

2. The custody of material in the raw state (as stores), in the partially completed state (as worked materials), and in the finished product (as stock), is a function of the management, and not of the foremen and workmen. Materials represent money and should be guarded with the same care that safeguards the company's cash.

3. In order to operate a system of management based on these principles it is necessary to have an operating or planning department to which all orders go and from which all detailed instructions issue to the different departments of the works. In order to do this satisfactorily we must have in this planning department the same kind of record for our large plant which the owner of a small shop carries in his head, namely: the raw material which he has available, the amount of work he has done on any order, an exact knowledge of the orders to be filled, and of the means he has for doing the work as far as both men and machinery are concerned. In other words, this planning department is designed to take the place of the one-man management when the plant has outgrown the ability of one man to know all about it. Without going further into the details of how such a planning

department is operated, it may be said that, inasmuch as a man can usually be taught to do well one thing or things of one general class, the usual modern policy is to divide all work into classes, or functions, and to train experts to perform each function in the best manner that can be devised.

4. The two grand divisions into which these functions may be divided are those relating to the handling of material and those relating to the handling of men. These may be enumerated in general as follows:

HANDLING MATERIAL

- a.* Purchase of materials.
- b.* Custody of materials and stores.
- c.* What shall be done to the material.
- d.* When it shall be done to the material.
- e.* Movement of the material through the works.
- f.* Care of finished product.

HANDLING MEN

- g.* How operations shall be performed on the material.
- h.* What compensation shall be awarded for the work.

5. The efficiency of the employee is conditioned by his physical well-being and contentment in his work. The management therefore is justified in interesting itself in

all common-sense steps toward improving workers and working conditions.

It will be readily recognized that the first six of the functions under Principle No. 4 are those which the owner of a small plant could supervise entirely himself.

*Natural Functions
of the Planning
Department*

These he would naturally keep in his own hands, even though he found it necessary on ac-

count of the growing amount of business to delegate the last two to assistants. Inasmuch as these six functions are those which are held on to longest by the management in a growing plant, it is natural that, when an organization has been devised in which a planning department (or departments) stands for a manager with an infinite amount of ability and capacity for work, these functions are the first to be brought into that department.

Moreover, it is impossible to control the method of doing work and the compensation which is paid for its accomplishment until the material and appliances with which the work is to be done are properly controlled. The first problem therefore, in modern production organization, is to begin the development of a department which will control the first six functions enumerated, leaving the last two, the most difficult, for subsequent consideration.

The planning department in its complete development is an organization which takes the place of the one man with a perfect memory and an infinite capacity for work, who has complete knowledge of all the tools in the factory and is familiar with the best methods of doing work with them, who makes it his business to learn about all new methods and appliances as fast as they are developed, or to develop any new methods or appliances that are needed, and to see that they are efficiently utilized in the factory.

*What the
Planning
Department is*

The planning department is the source of all orders to the works, and this system of management by the scientific method ultimately gives definite instructions for everything that is to be done. In the ordinary factory system, an order usually consists only of instructions as to what is to be done. In this system an order includes much more. It states:

1. What is to be done.
2. When it is to be done.
3. Where it is to be done.
4. How it is to be done.
5. How long each detail may take.

In introducing such a system we cannot at first say *how work is to be done* or *how long the details may take*, but we can say what is

to be done and when each portion of the work is to be completed. We, therefore, begin by setting a specific time within which the various operations should be completed in order to do the work economically, and so arrange our system of returns that any failure to live up to these instructions will be at once reported to the manager. The chief executive is thus relieved of the necessity of hunting up delayed work. The system brings each delay automatically to his notice.

VI

How the Team Puts Work Through the Factory

FIRST plan your work, then work your plan," is the keynote of modern production methods. How this is done in general has already been outlined in the unit on "Organization." The theory of planning has been developed in the chapter just preceding. Now we are to see how the theory is applied by the production team.

Some one must determine how work is to be done, and whoever this is—whatever the name he is called by—he may be considered a part of the planning department. Suppose the product to be made is a machine of some kind; it must be designed, drawings must be made, and complete "bills of material" must be written. Probably written specifications must be drawn. All these show *what* to make. *Planning the Work*

Now it must be determined *how* to make it. This is recorded on operation lists, tool lists, and equipment lists. Some of this information is put in form to make a "route sheet." If the time *when* to make each part or piece has been settled and recorded on the

route sheet, we have a regular time-table for the movement of the work through the factory. This movement is from one work-place to the next according to operation, in the order in which the operations should take place. Each operation should be completed at or before the time calling for completion of such operation on the route sheet. As work is reported completed at one point after another, the fact can be recorded upon the route sheet and thus show on the production office record the exact location and status of any piece of work in the factory.

To start work in the shop, materials, tools and instructions must be issued to the workmen. To facilitate this work, the modern planning room prepares "stores issues" or requisitions upon the store room for the material needed. "Tool lists" serve as orders upon the tool room for the tools required, and "work tickets" show what to do and provide the means of recording the time taken in doing it. If the planning is especially complete, an "instruction card" will be made out for each operation showing how the work is to be done, and giving the time allowed for the whole operation and for each detailed part of it. All of these papers and instructions applying to the production of a given article are collected together in

*Facilitating
the Work*

one file under the control of a dispatching clerk or time clerk.

As the stores issues are prepared, they are checked by the balance-of-stores clerk to make sure the needed material is in stores or that purchase requisitions are issued to provide it.

Work may be issued to the shops, either to the workman direct or through the foremen. When one piece of work is completed the work ticket is exchanged for a new one authorizing a new job, and with the work ticket go stores issues, tool lists, and instructions for the new job.

The workman may go to the store room and tool cage and get what the job requires, or the dispatching clerk may issue "move-tickets" to have both materials and tools taken to a man's work place a short time before the work should start. The practise varies in different plants. When material has been given out on a stores issue, the ticket is returned to the balance-of-stores clerk to enter on the records.

In planning the work and making up the route sheet, the order in which the work should be done has been determined. In many cases it is possible to vary this order to meet shop emergencies, and it is desirable that this possible variation in routing be recorded. When a given order of opera-

Routing

tions must be followed without variation, this should be stated on the instruction card unless it is perfectly apparent from the nature of the work.

When but one class of product is made the routing of material from one work point to another is cared for in laying out the plant. Conveyors may have been provided to carry the work automatically to the right place. Where some trucking method of transportation is used, fixed routes may be established for the movement of materials. Under such plans as the foregoing, it is not necessary to tag the work with moving instructions, but where the product is such that it cannot follow a fixed routing it should bear a tag showing clearly what it is and where it is to go for the next operation.

Where a trucking system is in use, truckmen tend to wander off the line of their shortest route unless carefully supervised. Definite instructions should be established showing how to go from one work-point to another, what buildings to go through, what elevators to use, and the like. Truckmen should be so supervised that they cannot interfere with other work.

When material is moved only by order through a move ticket, the return of the move ticket to the route clerk supplies information

from which he can record on the route sheet the location of the material. In some cases, the routing tag on the material carries coupons which are detached and sent to the route clerk as the material is moved from operation to operation. When the routing is automatic, as by conveyor, other means of keeping track of the progress of the work may be used as described later.

In most production it is convenient to divide the work to be done on any production order into lots. It is much easier to keep track of the work and collect the information as to costs when a lot is of small size. A lot, all of which can pass through one operation in one day or less, may be considered a small lot. Materials, tools, work tickets, are frequently issued against each lot number. Where a variety of work is done in one shop so that one product may require more time and operations than another, a lot system is more accurate in collecting costs than the continuous-flow system, although greater detail is necessary in keeping records.

The Lot System

When many lots of similar work follow one another through the factory, some means must be adopted for keeping each separate. A good way to do this is to mark the first pieces of a new lot by putting them in a

pecially marked container. The last pieces of each lot should likewise be marked distinctively to indicate the completion of the lot. This prevents confusion of one lot with the production ahead and behind it. When a new lot is started, work tickets must be changed, as must also the tool record, or material record if new materials are used. One lot should be completed before a new lot of the same material is started on any operation, otherwise the work is liable to be mixed and the records become confused.

In each operation a certain amount of material is likely to be spoiled. All of this must be reported so that the total of good material and spoiled material will equal the total of work started. The work in the shop should check at all times with the lot record as corrected for reported spoilage. To insure such accuracy there must be constant watchfulness in the shop. The lot record should be kept by the route clerk so that the route sheet may be checked as each operation on the lot is completed. Thus, the route sheet will show at any time the rate of progress of the lot through the factory and its present standing. Lot reports should be made as a part of the daily shop report, whether or not the entire lot has been completed so far as any operation is concerned.

In some factories, such as paper mills and chemical works, it may not be convenient or desirable to separate the work into lots. Instead, the continuous-flow system may be used. The plan may also be adopted in any line of production where the factory may be fully departmentalized, so that only one operation or process takes place in a department.

Continuous-flow System

Under the continuous-flow system all costs of operating a department for a period—such as a day, week, or month—divided by the number of units of material processed, will give the unit cost of the operation. The sum of the unit costs for all operations will give the total cost. All labor and material is charged direct to the department using it. Work tickets need not be changed during the day, and all records are simpler than in the lot system. Daily reports of production from each department show the progress of work through the factory.

Spoiled work is not always a complete loss. Sometimes repairs may be made. When work has been spoiled and may be repaired it is a good plan to separate this from the regular work, crediting the lot with the material thus set aside and charging it against a special repair lot number. In this way the cost of the repairs may be

Spoilage and Repairs

collected. Work handled in this way must not be returned to the original lot of work or any other lot without making proper records. Carelessness in this respect often results in confusing records of the amount of work completed or on hand.

It is unwise to set aside work for repairs and allow it to be forgotten or neglected for any length of time. The work may not be saleable unless completed with the original lot. The method of manufacture may change, making it difficult to process the neglected repair lot. By failing to utilize these repair lots promptly, a considerable stock may be collected which it will be difficult to get rid of later without diverting so much labor from regular work as to seriously affect production. It is by far the better practise to keep repairs cleaned up as the need for them occurs in the regular processes.

In many cases, not all work thrown out on inspection is "scrap" or "repair work." In the inspection of large quantities of work of certain kinds, a considerable quantity of good work is thrown out with the bad. It is worth while to re-inspect all material rejected on the first inspection, for the recovery of good work thrown out by mistake and to keep a record and check upon the work of the inspectors.

In many classes of work there are certain

amounts of unavoidable scrap or waste, not from spoiled work, but resulting from the regular processes. For example, in clothing manufacture a quantity of rags will be left after the suit is cut out; in metal stamping operations, there will be a quantity of blanking scrap left. The amount of this scrap affects the cost of the work. When the scrap is high, the cost will naturally be higher than when the scrap is low. All such scrap must be carefully collected and sold, as the scrap value may bear an important relation to the total cost of manufacture. In manufacturing brass cartridge shells, the scrap value is larger than the entire labor cost of production. *Salvage*

Spoiled work adds to cost not only because of the good material spoiled, but because of the labor and other expense used upon it. The productive capacity of the factory is decreased in proportion to the amount of spoiled work. A factory can afford to spend considerable money to prevent spoiled work for the sake of the increased output obtained from the plant, independent of the saving from decreased spoilage.

Sometimes a penalty is imposed upon workmen for work spoiled. They may be made to pay for the work spoiled, or for part of it. It is common to allow no pay for doing spoiled

work but to pay only for good work. Where it can be arranged to establish standards of good production and keep records of those who excel the standard a bonus may well be offered for excellent work. The total scrap production of the shops should be watched for signs of trouble and chances to make improvements. A good plan is to maintain a chart for this purpose, showing the percentage of spoiled work due to various causes.

*Penalty for
Spoilage*

It must be plain to the thoughtful workman that low production costs in the factory are of benefit to him. Sometimes he may feel that extra efforts on his part to lower costs, profit him nothing while increasing the dividend of his employer. In this respect he is sometimes right for the time being, but in the long run it may be shown that reduced costs benefit the employee. A prosperous manufacturer can maintain better working conditions and supply better tools to work with. This he usually does, as it is to the advantage of the manufacturer to consider the convenience and comfort of his employees. It is also common to find in the more prosperous plants better pay and shorter hours of work. Most important, however, is the fact that due to low costs a manufacturer can better meet competition and keep his factory

continuously busy. This in turn insures continuous employment for all employees, and a growth that will give work to ever greater numbers.

When low cost in one factory results in advantage in competition, other factories making similar products are spurred on to make improvements and increase their own efficiency so as to be able to make a lower price and meet the competition. Thus, low cost ever tends toward lower price—which means that all can buy more of that product, or such as they need of it, with less money. Efficient production means cheap production and large consumption. It means a better distribution of the good things of life—a higher standard of living for all.

From this discussion of the theory and general practise of “how the team puts work through the factory” under the scientific method, we come to a consideration of the control function of management. The immediate purpose of such a control is to keep at a minimum the quantity of capital tied up in raw materials and supplies, work-in-process and finished stock for a given output demand.

*Stock and
Production
Control. Organized*

The problem of control varies with the character and size of the industry. A factory

making only one model of a given product continuously would require much less detail than one turning out many kinds of products; but the fundamental principle of control is the same in all cases. The stock and production control effectively regulates all the expenditures on purchases and on labor; plans what is to be done; assists in bringing it about; and records what was actually accomplished and the why and wherefore of that result.

In the following discussion of stock and production control, the system in use by a precision industry which has to assemble its units as well as to process its materials is being described. The same principles would apply to any industry, though the application is simpler and the detail less elaborate in many.

Stock control and production control are two functions, but are closely related. Stock control should oversee at all times

Stock Control four classes of material, namely:

1. Raw material.
2. Shop consumable supplies.
3. Machine-shop tools.
4. Finished parts stock.

For each of these classes of material it should provide the following:

- a. A systematized location.
- b. A momentary record of quantity (perpetual inventory).
- c. Complete security from loss.
- d. Requisitions for timely additions to stock either by purchases or by new shop orders.

Raw stock control in the shops—by which is meant the control of raw materials and supplies (the first and second classes of material in our list)—makes use of a requisition system which should provide for the following as essentials.

Raw Stock Control

- a. A purchasing order for every item (originating requisition).
- b. Inspection and count, or weight, of all goods received before any bill is certified for payment.
- c. Quickly available information answering these questions:
 - 1. Has the material been ordered, and from whom?
 - 2. What price was last paid for it?
 - 3. Have the goods been received? If so, when?
 - 4. Has the bill been paid? If so, when?
 - 5. How much of this material has been bought within a given period?

Purchasing orders or originating requisitions should be sent to the department or person in charge of stock control in the first instance, and, except for material going into product, should have the general manager's O. K. also. Such requisitions should usually be originated by the following persons or departments, and should be confined to the purposes indicated.

Superintendent, for shop equipment and appliances.

Engineering department, for drafting supplies and for new materials on trial which have not been stocked.

Construction department, for building materials.

Mechanical department, for electrical and mill supplies.

Raw stock department, for all shop supplies and the renewal of stocks of production material.

As stock is finished in any one department, it should pass at once into the keeping of the stock department. This does not mean that

Control of Finished Stock it is necessarily removed physically to one place containing all the other finished stock. It means that the stock passes to the control of the department responsible for its custody, and that no one may remove or use it except as authorized by the stock department. In many cases, where further operations follow at once, it is found convenient merely to check the flow of finished work from one shop into another, the succeeding foreman becoming immediately responsible for the work delivered to him. In other cases, owing to lack of floor space, the succeeding foreman should not receive the product of another department if he is not

prepared to work on it at once; in these cases the stock keeper retains control and provides the place of storage.

The quantity of any part or assembly in process and in finished state is recorded in the stock control records, where all information as to the location and amount of material, supplies, and stock is at all times available. It cannot be too strongly emphasized that such records should keep account of all stock, in all stages of production. In many plants at present, the management knows what is finished and what has been ordered, but no reliable figures exist as to what the state of things is between these two stages. It is right there that a large part of the payroll in such plants is tied up. The stock control perpetual inventory and the data kept by the plant dispatcher furnish the up-to-date records needed.

While stock control provides useful and necessary features of a production control system, it does not of itself control production operations within the manufacturing departments. Three additional factors are involved in real production control, and these are:

*Production
Control*

1. Routing.
2. Dispatching.
3. Scheduling.

Routing is the standardizing of the order of operations. It determines the lines of greatest speed and least cost for each part, and insures that these lines are followed. It asks,

1. What operations are required?
2. What is the best order of them?
3. What is the best machine or tool to use?
4. What is the best kind of operator to use on it?

Dispatching in a factory is similar in purpose to train dispatching. To start a piece of work at a given time and to be able to predict accurately when it is going to arrive at its destination, the stock room—that is the task of the factory dispatcher. Dispatching, if it is to be worthy of the name, must “deliver the goods.” It is not “chasing” though often confused with it. Chasing is pursuing by individual attention things that have gone wrong. It will always be needed, for people who make no mistakes never make anything, but it should be exceptional. Chasing is chronic in the badly systematized industry and in poorly planned production. It wears out the nerves of all involved, and its troubles are fresh every morning.

Dispatching is preceded by observation of shop conditions, time studies of operations, standardization and routing. Thus the dispatcher knows exactly how long each opera-

tion will take, the capacity for work of each shop, the flow or amount of work which must be in each shop at any moment for a given output, and how far at any moment a shop is being used up to its full capacity.

The dispatcher must keep the following records:

1. Index of route cards, showing standard routing for each piece.

2. Individual order blanks, filled out for each checking "station" and showing the time of arriving and departing. A large department may need several stations, but in most shops one will suffice.

3. A capacity record for each department, showing how much work is in it, and also how much more might be in it.

4. A "follow up" or tracing system, which keeps the operations from falling behind. By figures or charts, or both combined, the tendency of any part order to lag is noted at once and steps taken to expedite it. Chasing is usually the discovery too late that it has lagged enough to be missing altogether from stock. Chasing is not dispatching, but a belated attempt to rectify failure.

Scheduling or planning, about which so much stress is rightly laid in modern production, is the last thing to be organized and must be preceded by all that has been described here.

When the routing is known to be the best possible for the plant as it is, and the dispatching is in successful operation, it is then possible to schedule or plan just what the production is to be from any department and

to determine just what "flow" of material to put into it. When that is done the management is ready to put all things to the test and to run a plant or industry with the minimum of "fixed" capital and of money temporarily tied up in the processing.

All schemes and systems and control plans must ultimately produce adequate product and profit, and be judged solely on that basis.

VII

Instructions for the Team

THIS chapter sets forth the details of how the foreman should manage within his own sphere; for a leader and a manager of men he must be to win success.

The details given are those of an actual industrial plant, whose organization is analyzed in the chart illustrated in Fig. 7. Moreover, they are given in the form in which they were issued as "Duties of Foremen," prescribed by the writer as manager of works for this organization of 10,000 men engaged in the highest class of munitions manufacture. They would not be the same for every organization or type of industry, but as they represent the requirements of a precision industry of the most exacting kind—one turning out rifles, bayonets, machine guns—and probably the maximum demands upon foremen, they embrace most of the duties which the latter may have to meet in any situation. They also exemplify the maximum of as-

sistance rendered to foremen by the fullest division of labor and the fullest application of functional aids.

DUTIES OF FOREMEN

Upon each floor each Foreman has full and complete **AUTHORITY** over his own men and will act as personal representative of the Department Superintendent. The Foreman must act as arbitrator between men; be courteous, but firm enough to show who is **BOSS** and thus effect discipline.

The fundamental Duties of Foremen are briefly summarized here and detailed in the following pages. Each individual Foreman's hope of increasing production and personal advancement depends upon the way these duties are handled.

SUMMARY

Be always on your job at starting time.

Enforce discipline.

Plan the assignment of work personally.

Keep close check on adjusters to see that they gage new work.

Prevent abuse of equipment.

Cooperate with the Safety Engineer.

Be open to suggestions from any and all of the men.

See that machines are oiled and cleaned regularly.

Make the men use the receptacles provided to deposit papers and other refuse.

Report unsanitary conditions, transmission troubles, plumbing, water and gas irregularities to works engineer's office.

Report troubles of power to power superintendent's office and also to your own superintendent.

Use service tool rooms to full capacity and do not call on machine shop for unnecessary work.

Collect standard samples of all work and place on board of inspection crib. (Duty of foremen inspectors only.)



• ORGANIZATION OF

• EMPLOYING 10

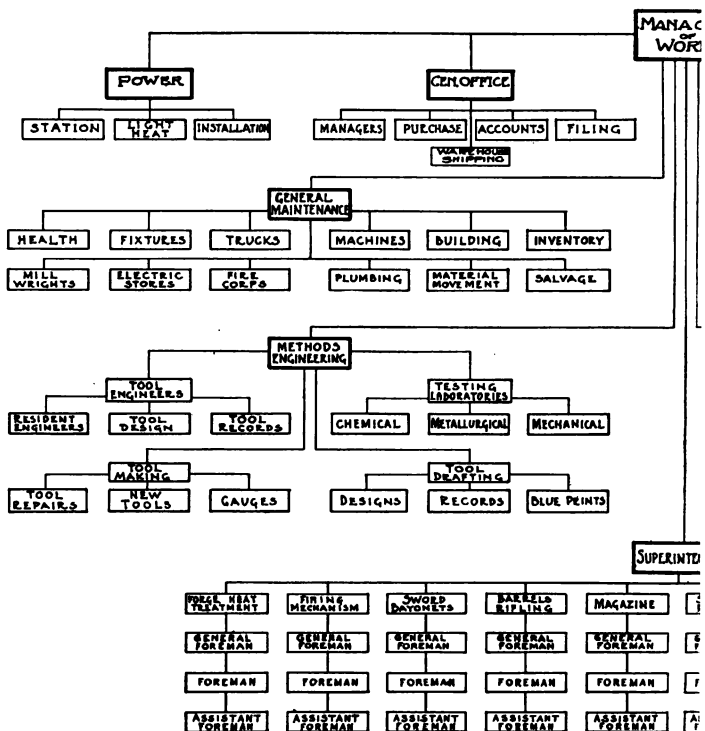
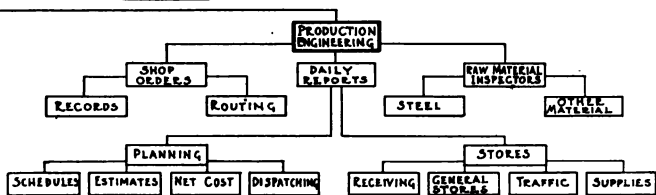
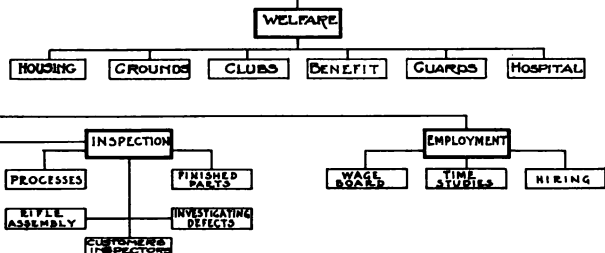


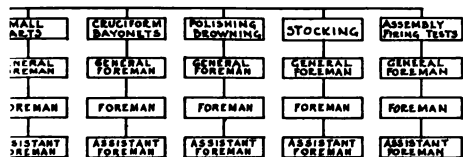
FIG. 7.—CHART OF A LAR

000 MEN.

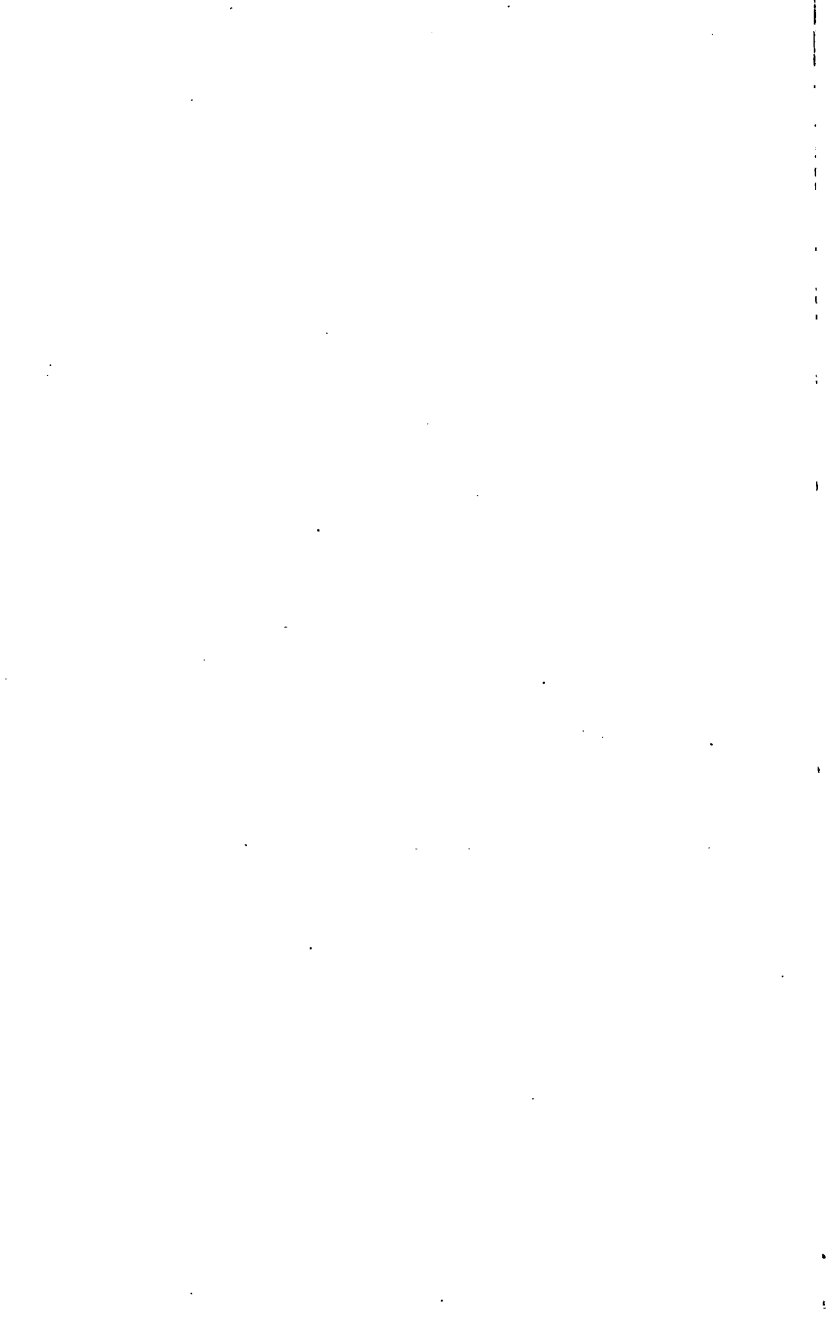
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DENT



GE MUNITIONS FACTORY



Cooperate with the Resident Engineer in your department who is responsible for the proper working of all equipment, whether tools or machines, and who represents your department to the offices, tool rooms and engineering more efficiently than you could do.

Watch your costs in regard to productive and non-productive labor, material, etc., and report findings of same to Department Superintendent.

Keep men at machines during working hours. Any attempt to wash up before quitting time or changing of clothes must not be tolerated. Every minute of our short day must be used.

Do not, under any consideration, try to induce another foreman's operators to come to work for you.

Watch that the workmen ring their own time cards on their own time clocks.

Assist Paymaster in lining up men.

Look over piece work earnings weekly and criticize fully to the Rating Department the standard performances they have evolved.

Use discretion in putting through raises.

Cooperate with your Department Superintendent, Resident Engineer, Head Inspector, Adjusters, Clerks—everyone. We are all working for the company.

"Passing the buck" does not pay.

It is *results* that will secure for you a raise.

Play fair and square and if you do not think you have had a "square deal," the Manager's door is open at all times, provided you have first approached those in immediate authority over you.

The Duties of Foremen are described in the order in which they come up during the day's work.

I. PRODUCTION

PREPARATION FOR STARTING WORK—MOTORS

Assign one or two employees to have all motors running two minutes before the whistle blows at starting time. These employees must familiarize themselves with the printed instructions regarding the starting of motors

which are posted on each main switch located above the starting box and will be held responsible to the Foreman for the reporting of troubles.

ASSIGNING OF WORK

Work must be so arranged that each operator will have work awaiting him and the Foreman should denote the machine it is to be performed upon. This will be accomplished by the Foreman designating on his list of employees the operation to be performed and giving the same to the Inspection Foreman of the floor. Work will not be assigned to operators unless so designated by the Foreman as being able to perform this class of work. First and second choice of work to be denoted on this Assignment Sheet, so that where it is impossible to work on the operation assigned, due to machine being down, lack of tools or material, another job can be given out without delay.

When and where possible, the operator should be kept continually on the same operation, day after day, provided he shows ability. The reason is obvious, in that it will decrease the changing around of assignments for each day, and that production will increase through the operator's familiarity and efficiency on the individual operation.

During the day, if an employee finishes his job, that was first given out, he shall report directly to the Foreman who must be ready to give him new work. The Foreman will make out a work slip showing job to be done and see that the time of starting is entered; also, as to whether the job is Piecework or Daywork, and the rate.

DAILY PRODUCTION REPORTS

Daily Production Reports are delivered to each Foreman marked with crosses (X) as to where his daily production, accumulative production, or both are below the schedule as issued by the Production Engineer. It is now the duty of the Foreman to note the reason of his failure to meet the schedule by symbols (lists of which were distributed and are on file at all times in Production Engineer's Department). These reasons must be correctly

stated, for it is with the help of these that the Production, Engineering, Inspection and Employment Departments can help you to increase the efficiency of the floor. These reports are to be returned to the Production Engineer by 9.00 A. M. each day.

SCHEDULES

Schedules are prepared and issued to all Foremen from time to time by the Production Engineer which are based on the production expected from each operation. These schedules are not prepared with the idea that they are something to "shoot at" and to come near enough to make a good showing, but are based on a knowledge of the capacity of your equipment. In case of doubt or bad results do not be afraid to ask for assistance. Confer with your Department Superintendent upon the schedules.

II. INSPECTION

SHUTTING DOWN MACHINES

The Foreman must keep in close touch with the Foreman Inspector of the floor, so that spoiled work can be caught at once, and the machine shut down. By making periodical visits to the Inspection Cribs, he can see what work is excessively high in rejections and take action on same.

The Foreman Inspector of each department (or his first assistant, day and night) has the authority to shut down any machine that is not producing standard work and will immediately notify the Foreman. In case of doubt as to the correctness of this step, the Foreman will bring the matter to his Department Superintendent for a final decision in conjunction with the Superintendent of Inspection.

FLOOR GAGING

Orders should be issued to the Assistant Foremen and particularly to the adjusters as to gaging work frequently. The adjuster should not permit work to start up on a machine after a shut down until the first three or four

pieces have been inspected. Immediate action can be had on these pieces by calling the Foreman Inspector.

RELATIONS WITH INSPECTORS (OR SUPT.)

No Production Foreman (or Superintendent) has any authority whatsoever over members of the Inspection Force. Similarly, no member of the Inspection Force has any authority over members of the Production Force. The Production Foreman may enter the cribs to view the work there. If he has any business to transact, he should do it with the Foreman Inspector, or with the Working Foreman in charge of the crib. He should not attempt to do business with the Inspector at the bench. Similarly, the Foreman Inspector should not do business with the man at the machine, but should confer with the Production Foreman. The Production Foremen are there as the representatives of the management to produce the proper quality and amount of work. The Inspection Foremen are there as the representatives of the management to pass upon the quality and amount of the work done. Although independent of each other, both must work together.

TRAINING NEW OPERATORS

Detailed and careful instruction by a gang boss should be given all new operators as well as a few standard samples of good pieces of work to show what is required.

RECORDS

Foremen will personally confer (with the Foreman Inspectors) at the close of the day or oftener if possible, on all lots of rejected work and repairs. This is necessary to give records to the Production Department and the Inspection Department. It will also enable the Foreman to call the attention of the adjusters and operators on the following day to such operations as are causing trouble.

REPAIRS

In the repairing of parts, the question of costs must be considered and should this be excessive, the Department Superintendent is to be consulted before salvaging.

III. CLAIMS

When a workman spoils parts, a "Rejection Report" (581) is made out in duplicate by the Inspection Department, who retains the copy. The original, which is delivered to the Foreman, is presented to the workman who is responsible for the faulty work, and if the latter acknowledges the correctness of the charge, he must sign the slip, which is then attached to the time card for forwarding to the Time Department. The Foreman should not be allowed to pass rejected work—this should be clearly understood. However, should the workman appeal on this "Rejection Report" the slip will be taken to the Department Superintendent for a decision in conjunction with the Superintendent of Inspection, and the workman will be notified of the result.

All claims for shortage of pay will be made to the Time Clerk—Desk Clerk—on the floor, within twenty-four hours after pay day. These Clerks will have records of the performances of the employees for the time covered by each pay roll and will inform them of the various items which made up their pay.

Only such claims as cannot be settled by the Time Clerk will be forwarded to the Assistant Comptroller's Department.

After investigation the claims will be returned to the various Department Heads for distribution to the men and will have noted thereon the result of the Assistant Comptroller's investigation. If the Pay Department is found to be in error, the amount will be paid in E-I-W, between the hours of 3.00 P. M. and 4.00 P. M. and the employee will be notified to call for it. If the employee has been paid in accordance with the record on the time card no further action will be taken.

IV. ENGINEERING ASSISTANCE

Special representatives of the Engineering Department (known as Resident Engineers) have been assigned to the Shops, one or more in each department, whose function is to aid the Foremen in securing the scheduled production, by designing new tools, adjusting the speed and feed of

machines, improving the processing methods, keeping all machine equipment in good repair and all other points of a technical nature. The Foremen are expected to utilize all the services of the Resident Engineers to the utmost and to confer freely on all matters regarding production or capacity of individual units, particularly in investigating the reasons of failure, where the equipment, whether tools or machines, is not satisfactory. By so doing the Foremen will seldom need to be absent from their shops.

V. TOOLS AND MACHINES

SHOP STORES (TOOL CRIBS)

Each Floor or Department will have its individual Tool Crib or Shop Stores and all requests for tools or supplies must be made to the Tool Crib. In instructing the workmen how to secure tools, the Foreman will remember that the Crib in the room or nearest one adjacent will be the only Crib that will honor requisitions from his particular department. The employee will sign his name on -419, showing number and class of tools received and when desiring to reorder, must turn in the old tools and again sign up for new ones.

REASONABLE LIMITS ON TOOLS AND SUPPLIES

The Foreman must realize the importance of keeping within reasonable limits on the consumption of tools and supplies and the magnitude of the task of keeping a record which is necessary in providing a supply to enable us to manufacture to schedule.

SOURCES OF SUPPLY

All tools will be taken care of by either Plant or Purchase Orders and will be delivered direct to the Tool Crib. Failure of the tools to operate will be reported direct to the Foreman, who shall consult the Resident Engineer and request him to remedy same.

Failure to procure sufficient quantity of tools from the

Crib shall be reported by the Foreman to the Supervisor of Shop Stores, who shall take immediate action to secure larger quantities.

Regarding supplies other than component tools, the Crib will carry a two weeks' supply. Order only from the Crib on these supplies as well as on tools.

In case of Emergency, when a New Tool or Supplies are needed, the Crib Attendant must be notified by the Foreman. The Crib keeper will get what is available and deliver without delay.

SALVAGING

The Foremen must see that all tools, when worn out, are returned for the purpose of salvaging.

COMPLAINTS

Should the Crib Service not be satisfactory, or prompt, call up the Production Engineer, who will give the matter his personal attention.

ANTICIPATION OF TOOL TROUBLE

The Foreman can perform a valuable service by anticipating tool trouble, through the inspection and salvaging of tools or by means of observation over adjusters.

VI. TRANSPORTATION

Should the Foreman have men idle, due to flow of work from another floor not coming through; or if a quantity of work has accumulated on his own floor which should be moved—he will advise the Move Section of the Production Engineer's staff of his difficulty. If no assistance is given, he should report the trouble to the Department Superintendent for action.

The duty of the Move Section is to maintain an even flow of work between floors and to see that work is correctly routed. Only by cooperation of Foremen can sufficient flow of work be maintained.

VII. LABOR

REQUIREMENTS

The Foremen, at such times as more labor is required will fill out requisitions (Form 244)* and have the Department Superintendent sign same before forwarding to the Employment Department. The requisition must give information as to the character of the work to be performed; the wage to be paid and whether Piecework or Daywork and any other information special to this matter. When a man is employed, the Employment Department will send along to the shop his rate card (Form 249), which must be filled out at once and sent to the Accounting Department.

TRANSFER

Where desirable to transfer an employee from one department to another, Card (247) is filled out and signed by both Foreman and Department Superintendent and forwarded to the Accounting Department. The time clerk must be notified of all transfers, so as to furnish Foremen with a correct list of employees.

No Foreman or other person in authority is allowed to approach an employee working under another Foreman, soliciting service in his department without the consent of the Foreman or direct superior of the employee whose services are desired. This rule must be strictly adhered to, to avoid unnecessary confusion, lost time and dissension.

No Foreman may authorize an employee to visit throughout the plant soliciting a transfer, and any employee found doing so will be subject to instant dismissal.

The Employment Manager will arrange through his office all transfers and he is at all times posted in the labor needs and vacancies in all parts of the plant.

* The numbers in brackets throughout the "Duties" refer to the index number of various cards, blanks and other forms used in this factory.

QUITTING OR DISCHARGED

When an employee quits or is discharged the Foremen will fill out card (Form 248) and forward same to the Accounting Department. The Foremen should be careful to fill out the places showing the workman's ability, character, etc. It would be well in cases of men quitting to talk with them and find out if they have any grievances and other information that could help all the Foremen to guard against losing men.

All quitting or dismissal cards must be O. K.'d in the Employment Office before being presented to the paymaster for wages due. The man dismissed or quitting must present the card in person at the Employment Office. The paymaster will not honor these cards unless they are O. K.'d in the Employment Office.

The Foreman has authority to discharge workmen for insubordination, but in cases of disciplining for spoiled work, rates, etc., the matter must be decided by the Department Superintendent. All employees persisting in the practise of carrying time cards from the plant will be dismissed.

VIII. WAGES

New employees will have their rates set by the Wage Board based upon the class of work the Foreman desires and also upon the supply and demand of the labor market. When granting an increase of rate, card (Form 246) is to be used, signed by both Foreman and Department Superintendent and forwarded to the Accounting Department. Increases should be made only on the basis of the man's daily efficiency, and not because the employee is a "good fellow" or is capable of holding a better job which we have not got for him.

The operations that have piece rates established have been set either with or without a demonstration, as required by the Foreman. Where rates have been set and seem unjust, a demonstration shall be requested by the Foreman to the Rate Setting Department. New rates going into effect will bear the signature of Foreman before

becoming effective. This is done with the view that if the rates are reasonable and signed for, the Foreman can prevent the men from laying down or fighting the piece rates without just cause.

IX. SAFETY AND HOSPITAL

SAFETY

Production on certain operations may be affected through fear of injury by the employee. The Foreman should bring all matters of this nature before the Safety Engineer of the Works Engineer's Office, who will co-operate and give advice as to safe-guarding of all equipment, and who will also present before the proper authorities any suggestions in connection with this phase of duties.

Foremen should not permit any employee to remove or tamper with safety devices or operate a machine on which the safety device has been removed.

HOSPITAL

There is located on F-5-S a hospital for the use of any employee of the Company who may be taken ill or is hurt while at work. The applicant for medical treatment will take card (Form 336) signed by the Foreman and ring the time clock to show time reporting off duty. This card admits bearer to the hospital and after medical treatment has been given the employee is told to return to work or go home. Should the nature of the employee's injury or illness be such that additional treatments are required, he will be told time and date to report, and notice in writing to this effect will be handed to the Foreman as an authorization. Upon returning to his work, the employee will ring his card in.

X. FIRE APPARATUS

All Foremen should learn the location of fire alarm boxes in or nearest to his department and possess knowl-

edge of fire escape doors and such other apparatus as may be installed on each floor. This information should be passed around to all employees. Also, any instructions that may be given by the Fire Chief will be carefully carried out to decrease any possible loss of life in case of fire.

XI. SERVICE

When repairs to transmission, buildings, etc., etc., are desired, call the Foreman of the Maintenance Division concerned. In case of trouble requiring Millwrights, call 360; for Beltman, call 361; for Electrical Emergencies, call 222.

When repairs to machines or fixtures are desired, call the matter to the attention of the Resident Engineer.

When prompt attention is not received, call the Works Engineer's Office, or the Chief Engineer's Office when machines or tools are involved, and your troubles will receive attention.

Maintenance Foremen must bear in mind that they are responsible for supplying service and that production must at all times have first consideration. No work should be undertaken which interferes with production until all details have been arranged, in order that the repairs, modifications, or changes can be completed promptly. The Floor Foreman must be consulted in each case before any work which will interfere with production is started.

XII. CONCLUSION

POLICY OF THE MANAGEMENT

It is the first rule of the management of this plant that business must be conducted honestly, smoothly, and harmoniously. Everyone's efforts must be directed toward securing the efficiency of the entire plant. *Friction means waste.*

Deal frankly and courteously with your associates. Help the other fellow to get results in his work, whenever opportunity offers.

Differences of opinion should be carried to your immedi-

ate superior for decision. Busy people have no time to argue. Get the exact facts and there will be no reason to argue.

Carry out the instructions of your chief, promptly, cheerfully and as efficiently as it is in you to do. If you do not understand his instructions or are in doubt as to what to do, *say so—do not bluff*. Your Superintendent is there to help you.

Try to arouse the interest and enthusiasm of your men—men work better when they are happy.

It is the duty of each Foreman to take the equipment as furnished and the workmen supplied him, and to teach these men to use the equipment so as to make good parts that pass the gages, and have the standard finish, and to make the quantity of parts called for by the schedules.

Plan your own departmental work ahead on the basis of these carefully prepared schedules which tie up the output of all other departments to yours, so that men, machines and material will come together at the proper time.

Pay the men for what they do, not for what they could do or might do nor for any other reason.

Keep a clean shop. Dirt is simply matter in the wrong place. There should be nothing in the shop that is not needed in the work of that shop.

VIII

Caring for the Team

WE have seen that "handling men" involves some moral responsibility on the part of foremen and executives for some of the reactions of the employees, and here we go to the root of the matter and outline the philosophy of Modern Production Methods in relation to these things.

At the bottom of the social movement in industry is what we may term "the spirit of the age." What is that spirit? It is in essence an increase in moral sensitiveness; a development of public conscience. In *The Spirit of the Age* the past, and even yet, only a small proportion of the people, especially in the large centers of population, chose to participate directly in the control and betterment of our vast community interests. Too often the cynical "What are you going to do about it?" was the torpid citizen's discouraging response to an appeal to his civic or social conscience. Even though he was met with a practicable program, he was difficult to interest.

The chief reason was that the majority of

men, both business and industrial workers, were living at such a pace that they were content to restrict their thought and strivings to purely personal issues of a material nature. Steady progress really depends upon individual improvement, on growth in personal character and in social sympathies.

Have we progressed in that direction? Most certainly we have. Employer, foreman and employee are much more sensitive about conditions of labor than they were. Citizens and voters, tired of the humbug which characterized much of the political activity of all parties, are calling for business-like government and are in a fair way of getting it. This sensitiveness is noticeable in our press, in our courts and in our legislatures, and it is on the increase. It is not a passing emotion either. It has come to stay and it is nowhere more noticeable than in industrial matters. It is a thing both of the heart and of the head and it has expressed itself in a program.

That program, in a sentence, is the conservation of our material and vital resources. Conservation means the safeguarding of assets

*The Program
of the Age*

against waste. The movement for conservation first took the form of an agitation regarding the probable early exhaustion of the visible supplies of essential raw materials and natural resources;

such as coal, lumber, water-power, and also land which was unfertilized, unirrigated or eroded by floods.

The movement was accompanied at first by all the inaccuracies, exaggerations and picturesque statements which seem to be essentials for striking newspaper or magazine articles, but these were soon exposed and we settled down to handling the truth about the matter.

From questions regarding the raw materials of our industry and civilization and methods for preserving or replenishing them, criticism passed to our wasteful methods of using them in manufacturing and in living. It did not stop until it extended to the handling of the human factors, the men and women composing the factory team. In fact, all the instruments of production, material and human, have undergone this questioning and scrutiny and are being weighed up in relation to their efficiency.

The modern movement in business and industry is nothing more than a candid desire to know the truth about things and about ourselves. It ascertains and puts on record the facts about any problem. It considers all the knowledge which can be brought to bear upon it and it determines, before the solution is attempted, the best means of doing the work

and the best way of handling and instructing the people who perform the task or direct its execution.

The spirit of the age, then, is essentially the preserving of all our natural resources, both people and things; and its programme is the most efficient use of what we have preserved.

In the past, men have been content to get things done somehow and to charge to the cost all the losses and wastages of the process. Materials seemed to be capable of endless exploitation, and human beings plentiful enough and little concerned as to how efficient their effort was, so long as it produced a living. In recent years, this attitude has given way to a new recognition of what is essential in production—though vestiges of the former ideas still exist.

Too many men, for example, are willing to give effort but practically no thought to their jobs. When they get but a small dividend on their meager investment, they grumble about it in the spirit of the Vermont boy who suddenly disappeared from his father's farm.

*Giving Your
Mind to Your
Job*

Rumor had it that he was working in a law office in a neighboring town, but the farmer paid no attention. In about ten days the boy suddenly reappeared and went about his

chores without a word of explanation. After a day or two the father said, "Well, how did you like the law?" The boy replied, "The law ain't what it's cracked up to be. I'm sorry I learned it!"

The fact is that the people who do not think in this world are the mere tools of the rest of mankind. Efficient preparedness for life-work and for any social task is just the result of the interplay of three personal factors: Thinking, Imitation, and Experience—these combined always with the character and industry necessary to intensify them. For it is not enough merely to know. We must be in love with the truth. We must be willing and eager to be up and doing for it. There is a mine of social and industrial helpfulness in every man if his *attention* is secured; his *interest* aroused; his *imagination* touched; and his *will* enlisted by the management and the foreman. Under such favoring conditions he will follow you anywhere.

The safety movement is a striking example of what can be accomplished in the direction of conservation when cooperation between the management and the men becomes a reality. Though the United States was later than any other industrial country in providing legislation for the enforcement of physical

*The New Attitude
Toward Accidents*

safeguards for industrial safety, American industry is going far beyond the industries of other countries in voluntary organization for accident prevention.

The change came when we refused to accept the long roll of death and injury as a legitimate toll upon industry: when we became willing to ascertain the facts, to face them frankly and to analyze our experience with accidents. When we did this we made some interesting discoveries.

We found that accidents had been regarded largely as disease once was. That in our mills and plants and courts and legislatures there was a superstition about industrial injuries and public casualties. They were inevitable, they were fate—that was what everybody believed. The old-fashioned workman, if he lost a finger or a limb, said it was God's will, or that it was "coming to him" anyhow, while the man alongside of him thought, "I am going to get mine some time."

The men at the head of the mills and railroads largely held the same opinion as their employees and foremen, and their controversies were not over loss of life and limb, but over their surrender value. "Accidents are unavoidable," they said. "They are the price we must pay for progress." "There is nothing certain but death and taxes, but accident

makes a good third." And for a time everybody accepted the doctrine that our great communities, railroads, mills and mines simply could not develop without a heavy toll of blood. From this doctrine that accidents were unavoidable, it was but a step to charge up the costs of accidents to the industry, not to the individual. This was a great advance over the old method of compelling the injured man or his survivors to struggle for consideration, but it did not solve the problem of "prevention."

Now all this has been changed. Transfer of the financial burden of accident from the victim to the industry does not solve the problem of waste. We no longer pretend that factory laws as to safeguards and occasional state inspection will suffice to banish accidents from our mills. We know very well that they will not and that safety in the mill is not going to come either from the state house or the counting house. Both employer and worker have a new belief about accidents and a new faith in the possibilities.

They know now that accidents are avoidable—that they are due largely to controllable causes and elements. "Ah," but you say, "what about ignorance, carelessness, indifference, foolhardiness on the part of the employee?" Well, these are controllable too.

We set out to treat these phenomena of industry by the "scientific method." We accept no off-hand toll nor second-hand explanation of how an accident happened and "let it go at that." No. When an employee is hurt on one of our railroads for instance, there is a body of men at once on the trail of that accident, tracing it down to its source and trying to learn everything possible from the occurrence. What brought it about? Was it a mechanical failure or a mechanical mystery? Was it the fault of an indifferent or negligent person or due to rashness or overconfidence? In other words, absolute frankness and regard for the truth have taken the place of perfunctory investigation. All our hope for prevention lies in attaining the truth about such occurrences. Therefore we now ascertain the cause and go after that cause, no matter what it is.

When we do this, however, we are led far beyond laws in our search for safety in industry. We find the scope of the work to embrace every factor in industry. We find that it centers around the human factor. The kind of man who comes to the plant is fully as important an element as the kind of plant he comes to.

*The New Scope
of Safety Work*

Much has been written and said about the industrial injuries caused by neglect of em-

ployers to protect dangerous machinery; some of the criticism of legislation it has occasioned has been justified, but the real problems of safety are far more involved with the habits of the workman and his overseer and their mental and moral development.

The great bulk of our mill accidents has relatively little to do with unprotected machinery and much to do with poor supervision of the help, unsuitable assignments, undisciplined natures, ignorant minds and careless or impulsive conduct. It is this recognition of the human factor in accident occurrence and its prevention which has elevated the safety movement from being solely a matter of expert engineering service and of rules and regulations to the higher plane of a vigorous campaign of persuasion and enlightenment which no legislation could ever secure.

It is amazing, when the great mass of plant and industrial accidents are analyzed, to find how many of them are due almost wholly to the inattention of the injured person. Formerly such inattention was *Pay Attention* noted in the accident report, regretted, and that was practically the end of it. Now the safety movement says to the man and to those over whom he is set, "Pay attention." That is the thing you must educate men to do—

to use their eyes and to use their ears. It is not wholly, nor even chiefly, a struggle to procure and maintain efficient physical protections on machinery and plant. It is chiefly a fight upon the sluggish intellects of dull workmen who may be handicapped by ignorance of the language. It is a constant campaign to secure attention to the safety idea. And that attention is secured not by elaborate policy but by a very ancient rule of teaching—"Line upon line, line upon line. Precept upon precept, precept upon precept. Here a little and there a little."

You simply cannot have safety in plants and industries without this sustained attention. It has got to become the habit of

*The Value of
Habit in the
Plant*

men and women, day in and day out. A man cannot be attentive today and inattentive tomorrow. He must give sustained attention and in seeking to create it you are educating that man to one of the most important mental functions. If you can go further and enter the home, the church and the day-school with this education in safety habits, you will be doing a great service to society, and it will react in a notable way on all the tasks in the shop which call for the same trained abilities.

The first result of centered attention is invariably action. Just the moment people

concentrate on the idea of danger, they begin to act; and the caution which they cultivate becomes a habit. It becomes something you may reasonably expect them to do thereafter.

People frequently refer to habit only in an uncomplimentary sense. But habit is a most valuable trait of human nature. It makes possible the efficient repetition of endless varieties of acts without a drain upon the nervous system, and leaves the mind free for more important demands.

No sooner do we become habitually attentive to a task or a rule than our imagination begins to work upon it. We begin to make helpful suggestions about it and that is one of the finest results of this safety movement. Beginning with laws which rightly demand certain physical, supervisory and material precautions from employers, it becomes in the end a question of organizing to secure safe-working habits. This is secured by the co-operative, educative and persuasive work of men and women upon one another. So long as safety was solely dependent upon the observance of legal enactments, the number of casualties was not seriously reduced; but when the employer took the initiative, as certain large concerns did, at great expense—the United States Steel Corporation is a notable example—it was proved beyond all doubt that

men were expecting too much from the law and too little from themselves.

It was found to be an urgent necessity that the safety movement should be socialized.

This does not mean that it should be talked

*The Demand for
Intelligence*

to death, but that it should be a democratic movement; that the folks who work together should

plan together, confer together and act together to eliminate careless, thoughtless actions both for the sake of the individual and of his fellows to whom the consequence sometimes extend.

The English cotton industry attained its present high safety status after years of agitation, conducted largely by a few people with strong humanitarian leanings. To this the employee contributed but little assistance or enthusiasm and in the earlier days he did not even possess the vote or the courage to assert himself.

But imitation of England and the older civilizations is not going to help us much. Forty-eight sovereign states, each a law unto itself in safety matters, makes it impossible, even if uniform laws were adopted, to secure in our wide domain similar administrative results. So, in America, we are going about this matter without expecting the state to manage our plants for safety. We welcome

all the aid it can give us, but the task before us is one that no law can solve, for it involves the voluntary limitation of the liberty of the citizen and the admitted leadership of the foreman.

The choice of safety committees on which foremen sit is most important, for the success of the whole movement hinges on their personnel. Men who are heart and soul in the work are the men for the task. There is no place for the man who looks upon this assignment as an opportunity to kill time; nor for the pessimistic workman who journeys through life nursing his own particular grouch.

*Forming Safety
Committees*

The man who is needed is he who appreciates the opportunity offered for the betterment of his fellow employees and who does his best to make them realize that the company is expending its money and its ability for their welfare and their safety.

You cannot get golden conduct out of leaden instincts. Without enthusiasm, the knowledge, the thought, the wise organization which we need, will go but a little way in influencing the mass of employees. But knowledge touched with emotion is always inventive, ingenious, persistent and victorious. With the facts of accident experience before them and the wide publicity now given most

generously to the successful efforts of others, your plant's engineers and experts can attack hitherto insoluble safety problems with faith and zeal, as well as knowledge. Supervisors and foremen will plan for safer operation and more suitable assignments of inexperienced help. Individual workmen on the committees will use their personal contact to reprove, instruct and persuade the ignorant, the careless or thoughtless.

Workpeople at large, when their attention is secured and their interest aroused, will talk "safety first" on the street, in the cars, in the home and among acquaintances. Then the plant will begin to realize the amazing cumulative effect of an "uncommon attention" to a central idea. *Attention, Interest, Vision, Action, Repetition, Habit*: these are the successive steps to industrial safety and to success in the whole social program for health and betterment in industry.

Does it pay? someone asks. Of course it pays! Not only in dollars and cents, but in creating an organization and in building up an internal asset of good will that will stand like a bulwark when the temporary economic friction that is the price of democratic industry has to be faced and from time to time removed.

IX

The Wage Problem

THE Course has already discussed in Unit II the typical wage systems in operation at the present time. All people actually at work in plants and industries are aware of the hostility and suspicion which some employees exhibit towards every kind of preferential reward for a day's work. Foremen and employees alike are also aware of a highly organized external movement to prevent the truth about a day's work from being found out or utilized.

What are we going to do about it in the Reconstruction now upon us? Leave it alone? It won't be left alone. Leave it to your Uncle Sam? He can't tackle the job. Apply our best brains to it in individual plants and work out a just solution? Yes, and in doing so the foreman of the new industrial era will be right in the front trench and will lead his men over the top if he brings the necessary personal qualities and experience to the task. The employer too must not rest content with temporary agreements which are only an armistice between conflicts.

Consider for a little the fundamentals of labor efficiency apart from any particular systems which have been devised to increase and reward it.

The Problem Analyzed A workmen's actual earnings should vary, and in some wage systems do vary according to two personal factors, viz: *ability* and *diligence*. His rated wage is usually determined solely by his ability, or the kind of skill he possesses. The wage problem is therefore primarily that of

1. Determining the grade of ability or technical skill.

2. Placing the crafts, trades, tasks and labor services in their proper grades.

3. Determining the best means in each case of stimulating the worker to due diligence.

4. Insuring a wage return to efficient men in each grade which will permit of a reasonable standard of living and adequate leisure. The law of supply and demand alone will not insure a just arrangement in all cases.

5. Seeing, that, even when all these conditions have been met, the incentive is not carried to extremes to the detriment of continued efficiency of performance. This may be caused by induced fatigue and consequent gradual impairment of physical fitness.

"Stunts" are not a safe guide to shop and industrial daily performance, and enthusiastic but inexperienced authors of these should not be given the very important task of dictating and enforcing modern production standards.

It has been rare indeed that the five conditions enumerated have been fully met. Frequently when accomplishment has been claimed and the doer has departed, owners and foremen alike have been rudely awakened to many things which they firmly believed about their men and their methods which turned out to be *not so!*

As a matter of fact, organization inefficiency and economic friction usually prevent the adequate consideration of all the factors of the wage problem, and the customary established wage and day's work delivered for it in each case is far from an ideal result. Indeed the plainly avowed standard of not a few who profess to have the workman's best interests at heart is "all the traffic will stand and then some more."

*The Problem
Shirked*

They demand a high standardized general wage irrespective of the quantity or quality of the individual performance, and make a strategic retreat only when the economic results are too plainly evident to be longer ignored. This attitude does little to secure "diligence" and promote efficiency on the part of the workmen, or to place the wage problem on a higher plane of thought and action on the part of the employer. Yet in spite of all discouragements, ignorant opposi-

tion and the lack of ability to tackle the problem effectively from the employer's side, the initiative in this matter *must* come from him. He must educate himself in industrial economics and handle tactfully the many human factors involved.

One can understand but one cannot defend labor's objection to frank but tactful study of the factors of the workman's efficiency. Nearly all wage-rating disputes turn upon a difference as to what are the facts; and the workman's natural stand in a dispute is to conceal these facts, though frequently he does not really know the possibilities himself.

Common-sense would suggest that studies in modern production possibilities should be conducted quite apart from the question of

The Problem Tackled rating. The human factor here can be handled best by a foreman who is "a regular fellow," a man who has come up from the ranks and who the workman would never think of attempting to flim-flam or to deceive with any camouflage of production results.

There are decided objections, however, to rating and working the employee as if he were a machine; and they are not in the least disposed of by giving a wage which is the envy of all less energized workmen. Yet, exceptional earnings are frequently quoted as

though they were a conclusive argument. There are quite a few things besides earnings that go to make a contented and stabilized body of workmen.

Any tendency to push initiative and incentive to undue limits is much reduced when those who set the standards of working and those who manage the work are one and the same organization. For then those responsible for mistakes must continue to live with all their mistakes, and must eventually produce product and profit with general all-round harmony and satisfaction.

The moment a brainy capable group of foremen under a wise far-seeing management get their workers in accord with an honest open attempt to find out "the truth, the whole truth and nothing but the truth" about their daily tasks and troubles, that moment does the sun begin to ascend on the industrial horizon. A great good will is created which will defy the impact of the outside troubles so often imported into restless organizations without definite clear-cut policies of management.

Such studies often reveal in all kinds of industries, not merely in machine shops where they were first practised, that the supposed excellence of the prescribed methods of production has serious flaws; they show that the

traditional skill of not a few workmen is largely a myth, and that the daily performance of some men is simply the aggregate of a series of "bad habits" conscientiously persisted in and sold to the highest bidder as the product of an acquired "trade."

Manifestly the wage should and does vary with the standard of living of the workers, with the prevailing cost of necessities, and with the changing cost of certain conveniences of civilization. The day's work, however, is not so affected. Its output possibilities do not vary with those factors, and should be considered and studied apart from the rating question.

What is Essential Five considerations are involved in the right settlement of the wage problem, and when these are met many of its more perplexing difficulties will melt away. These five essential considerations are:

- First:* The truth about "a day's work" in every grade and task.
- Second:* The facts about the cost of a reasonable standard of living for each grade of worker and for different locations.
- Third:* A higher calibre of owner, manager and foreman; sympathetic, tactful and full of patience with the unruly and undisciplined minds to be found at the bench and the machine. Many of these complicate the unavoidable economic friction of democratic industry by temper and immediate resort to force both on real and imaginary provocation. Even after compromises and awards

satisfactory to the representatives of the employees, the latter have confessed again and again their inability to get workmen to live up to such obligations. Nothing but a campaign of education, mutual forbearance and an honest desire to get at the truth of the matter will solve labor difficulties.

Fourth: In the impoverished world of "after the war" the worker and his employer must "deliver the goods" with a certainty and willingness which were not particularly noticeable in many cases in the era of high war wages, of the worker's high cost of high living and of cost-plus contracts necessarily imposed upon industry for a time.

Fifth: Some way of taking the workman, *himself*, into the confidence of his own employer directly or by representative committees on all matters affecting his interests must become the general practice—where today it is exceptional. The workman's *right* to be represented by the best external ability, if he so chooses, cannot be denied, though it should never be permitted to override the individual preferences of other workmen acting either individually or collectively on their own behalf.

Some of the difference today between industrial establishments is due to the knowledge they have painstakingly acquired about "a day's work" and its possibilities and to the way in which they are led and officered; but not a little is inherent in the removal in some cases, under war policy, of "the economic urge" which ever since the Gates of Eden were closed has been at once man's curse and his salvation.

In the return to a wiser order, the fore-

man is the pivot around which the field operations will center. When we get down to business on this subject and approach the foreman of the reconstruction, we find him desirous everywhere to prepare himself for a brainier, bigger task than ever before.

*The Foreman is
the Pivot*

He may, if he chooses, so enter into the life and aspirations of his workmen as to steer them clear of much error, and represent them faithfully and accurately to the employer. There will always be differences of opinion and some economic friction. But there should be agreement about the facts wherever the scientific method is conscientiously pursued and extended to all matters contributing to the well being and satisfaction of the worker.

No detail of a foreman's job is so fraught with good to industry and to the community as an honest, informed and sympathetic attempt to assist in solving the wage problem so as to provide a reasonable standard of living, and at the same time to leave "the economic urge" upon employer and employee alike as an impelling motive and to produce the maximum of commodities of the requisite quality for a needy world.

X

The Principles Applied in a Typical Organization

THE underlying practical motive of modern production is not indiscriminate speeding at the expense of the workers. Its purpose is to secure by cooperation the economies obtainable either through anticipating or by locating and removing all wasted time and ineffective or unnecessary effort and expense, whether clerical, manual or mechanical. It is directed toward enabling employee and owner alike, under the most favorable conditions, to make the most of the opportunities of the working day. Its general method, as we have seen, is to remove a large part of the usual burden from the shoulders of the employee and place it upon the organization. How this result works out in a particular case will now be illustrated.

The example chosen is an American industry engaged in the manufacture of typewriters. Its successful management involves the economical handling of the labor of 2500

*Organization of
A Typewriter
Works*

people, of whom 500 are women, and the production of about 100,000 typewriting machines a year and a considerable number of spare parts. Each machine contains about 2500 individual pieces, each of which passes through from 6 to 30 machining and other manufacturing operations. Many trades and handicrafts are required for their production.

Operations on the typewriter begin with the pig iron, and on its packing box with the log, and practically all of the unit parts are organized within the plant. A total of about one million interchangeable metal pieces of several thousand varieties must be produced daily, and an equivalent number of parts be built each day into the different models of the typewriter, its tabulators and its adding and subtracting attachments.

A machine may be built to write in any one of 84 distinct languages and its keyboard—literary, commercial or technical—may be any one of five hundred already registered, or it may be altogether special.

Orders for the typewriter reach the works from every part of the world, and only a small portion of the demand can be anticipated by stocking finished machine product. A rush order for any standard machine not in stock should be shipped by express, with-

out interrupting the regular flow of work, in not more than 48 hours after its receipt.

The requirements outlined demand a very special method-study and division of labor in the preparatory, machining, parts, assembly and machine building departments and all the conditions must be met *The Problem*

with economy as well as accuracy and dispatch. The economic problem expressed in a sentence is: *to produce daily the full quantity of satisfactory machines in all the required varieties by the most efficient shop and labor arrangements and with a minimum of fixed and cash capital locked up in the process.* An organization and a system of management which will accomplish this and continue to do so with harmony and satisfaction to employer and employee alike is the desired end.

The problem just stated was met by the organization charted in Fig. 8. Except in that every arrangement of functions has been based on business facts, not preconceived fancies, and on careful analysis, no "scientific" claim is advanced for the system, which is modified in its details as often as desirable.

The organization is indicated on the chart by the numbered and grouped functions which the various assistants control. The figures below each division on the chart in-

PRODUCTION METHODS

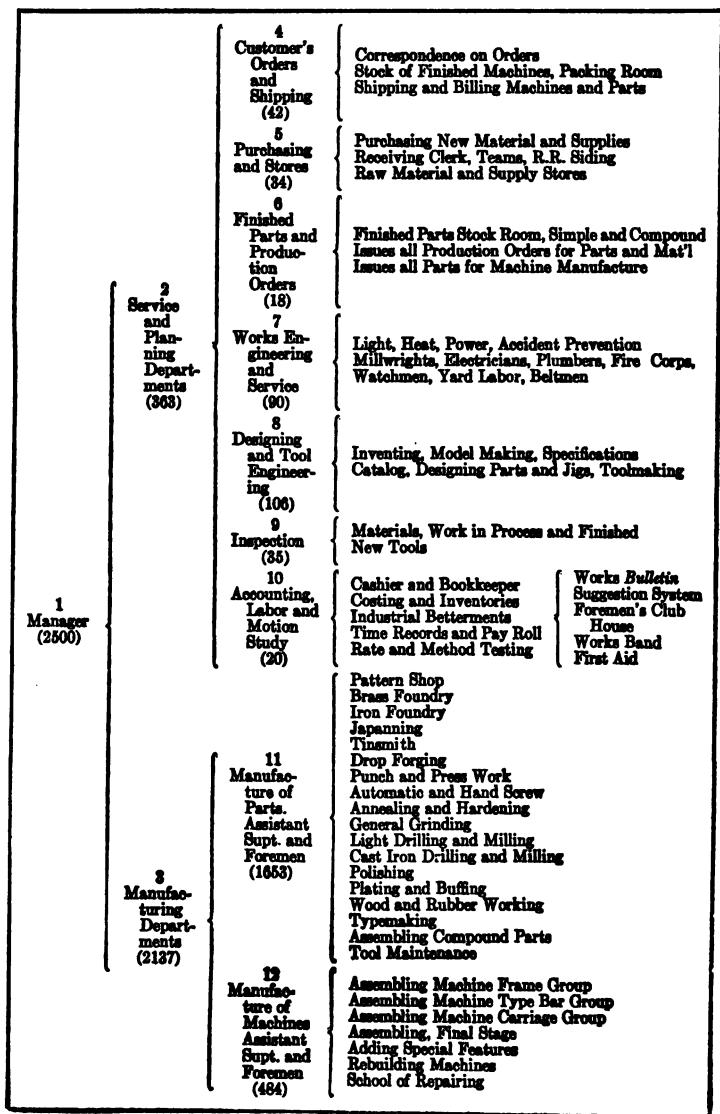


FIG. 8.—Organization of a Typewriter Works

dicating the total number of employees engaged in the section and afford by comparison some idea of the relation, under the system, of direct labor upon the product to the various preliminary and operating services found necessary.

A manager (1) is in control of the whole works. He exercises this supervision directly (2) over all the seven executive departments (4 to 10) with an engineer at the head of each and communicating directly with all departments concerned with his functions. *The Organization*

A superintendent (3) acting under the manager controls the separate factories, for parts and machines respectively, through the two assistants and the foreman (11 and 12) who supervise the twenty-five manufacturing shops.

The customer's order department (4) handles all such correspondence, issues all production orders for the building machines, either stock or special to the machine assembly factory (12), packs and stores the finished machines on perpetual inventory and ships and bills them and all other products sold.

The purchasing department (5) buys all material and supplies on the specifications of the works and designing engineers (7 and 8). It will be noted that with the function of

purchasing is combined that of receiving and storing upon perpetual inventory. This combination has been found economical but its possibility depends in any instance upon the caliber of the department head.

The purchasing engineer has not only to order the goods advantageously and within the right time, but has also to secure prompt delivery, verification and safe storage and on demand from the production-order department (6), he has at all times the undivided responsibility for "producing the goods."

Controlling the Production

The production-order (or planning) department (6) controls all work demanded from the eighteen shops (11) producing finished parts and delivering them to its stock room. This production planning department runs almost automatically seven-tenths of the plant on a perpetual inventory basis. The flow of work in every shop and at every stage in each shop and the quantity of every finished part of some 5000 varieties in the stock room is on record at all times, both in the departments and in the stock-room office.

The production clerks in every shop report direct to the production-order chief. They (1) receive for the foreman the order to produce, the routine, the method and the material, and (2) get from the foremen and

inspectors the certified finished work, for record and for storage or for passing on to another process or department. The production-order department's ordering and controlling operations are based upon figures for each of the parts carried in its finished-stock perpetual inventory, and on data from which the manager is responsible.

In the works system here described each section of the organization in conference with the manager and superintendents has its appropriate part in planning, and complete records of the same are readily accessible. The works engineer (7) plans for all power and plant general services, including safety precautions and all maintenance of buildings and machinery. Special accident prevention measures adopted at these works were notably successful.

The design engineer (8) plans for invention, model-making, part-design, part-tooling and tool-making and the preparation and revision of the catalog of parts which is identical for sales and shop use. In this connection a simple grouping in tens of thousands up to 99,000 has been adopted, which reveals the group by inspection and a simple or compound part by even or odd ten thousands, for the many parts listed and leaves

*How Planning is
Organized*

ample room for additions in each group. The writer has found that symbolic or mnemonic systems of nomenclature, while sometimes useful in accounting, are usually undesirable and unnecessary in the shops and can be replaced by simpler numbering methods.

The engineer (8), foremen (11 and 12) and motion-study department (10) plan for and test machine tools, small tools, shop routine and speedy operation and assembly methods, all of which, when approved, are standard till modified.

The inspection department (9) plans for, executes and reports to the manager on inspections for quality of the raw material, and at the prescribed stages, of new parts and new machines. It also reports on all missing and spoiled work, assigning responsibility whenever possible and the cash value of the losses. The prescribed inspection tests are standing orders until modified.

The manager (1) in conjunction with the production-order department (6), and taking account of the shop capacity for every part and present and forecasted trade conditions, performs the following planning operations:

*The Manager
in Planning*

a. Plans for a daily "flow" of certain standard parts which is a standing order till modified.

b. Plans the quantity "to order" and "to stock" of every other part manufactured; also a standing order when fixed.

c. In cooperation with the customers' order department (4) the manager determines daily the number of varieties of typewriting machines which are to be built from the parts in "stock" and in "flow."

d. In conjunction with the purchasing engineer the manager executes all contracts for material and controls the amount of capital tied up in stores. The items listed second, viz., the "quantity to order" and "to stock" of over 5000 different pieces, are the most important of all the figures requiring to be planned. These figures give practically a picture of the shop's ability to produce in every respect. They are used with confidence on every occasion by the production-order department and control what is by far the largest part of the pay-roll expenditure.

For every part, maximum and minimum finished-stock figures are established. These figures are based on a careful analysis of the time of "flow" of the part from start to finish and on existing trade conditions. "The quantity to order" is so fixed that, if the order is placed when the perpetual inventory shows "normal" figure in stock, the first portion of the new order will be coming into the stock

room before the minimum is reached. The same regulation is adopted for all stocks of raw material and of finished machines.

The fixed capital investment in buildings, machinery and jigs is used intensively, and does not permit of heavy stocking. In times

*Caring for
Fluctuations*

either of inflated or depressed business, the scale on which material is purchased, or parts and machines manufactured, is at once modified by the management by suitably altering the permissible maxima and minima and the quantity to order for every item.

The general result of the cooperative system described is that all preliminary planning and basic figuring are carried out by the practical experts and departments best fitted to do so, either singly or in conference, and unnecessary intermediaries are dispensed with.

The results are fully recorded and subject to criticism and suggestion from any source. The production-order and stock-room force (18) is small for an organization of 2500 people. There is no intervening army of clerks nominally doing this recording work but actually merely manipulating card records of data for which others with technical or practical experience are responsible.

The work being wholly of a repetition nature—though it is not processed in every

particular every day—the foremen are not functionalized out of authority and made to feel that they count for little in the general scheme of things. Relieved of all clerical duties and because of the motion studies and straight piece work based upon them, of practically all policing duties, the foremen are left free to manage their own shops and to make the most of— if possible to suggest improvements upon—the equipment and instructions given them.

*The Place of
Foremen*

Under these conditions they prove to be the most valuable employees on the pay roll and the most fruitful in good suggestions. Busy foremen are not able to carry out with the necessary detail and thoroughness the preliminary rate and method tests required by the system; if these were left to the shops, progress would be much slower. But when methods and rates have been fixed and are presented to the foremen for application they are keen critics of the results and not seldom are able to “go one better.”

The accounting, labor and motion study (10) is the last executive group to receive special mention here. Just as the plant production is normally run by the production-order department, its methods of operating, its rates and its apparatus for every single part have to be certified in all cases by the

rate and method testing division before production on any scale is authorized in the shops.

This small group of independent experts is an essential part of the rating and method-planning system, and the thoroughness of their work is the justification for a simple straight-forward piece-rate system of payment in which the exceptional worker retains his surplus and is not asked to share it with his employer in any form as is done in systems where the rating is largely guesswork.

*Planning Methods
and Fixing Rates*

Briefly stated the designing engineer (8) having previously consulted all the foremen and experts interested, turns over his jigs and tools and proposed shop routing for any new part for criticism, and motion, speed and fatigue studies. These are carried out by the testing experts of the accounting department rapidly and with precision and, subject to acceptance by inspectors, practically the whole direct labor of the plant operates under 20,000 straight piece-rates.

The "division-of-labor" and "motion-study" results are such that workers, properly selected and trained, make good wages in all departments, while furnishing product at a satisfactory labor cost.

It follows from the system of payment ap-

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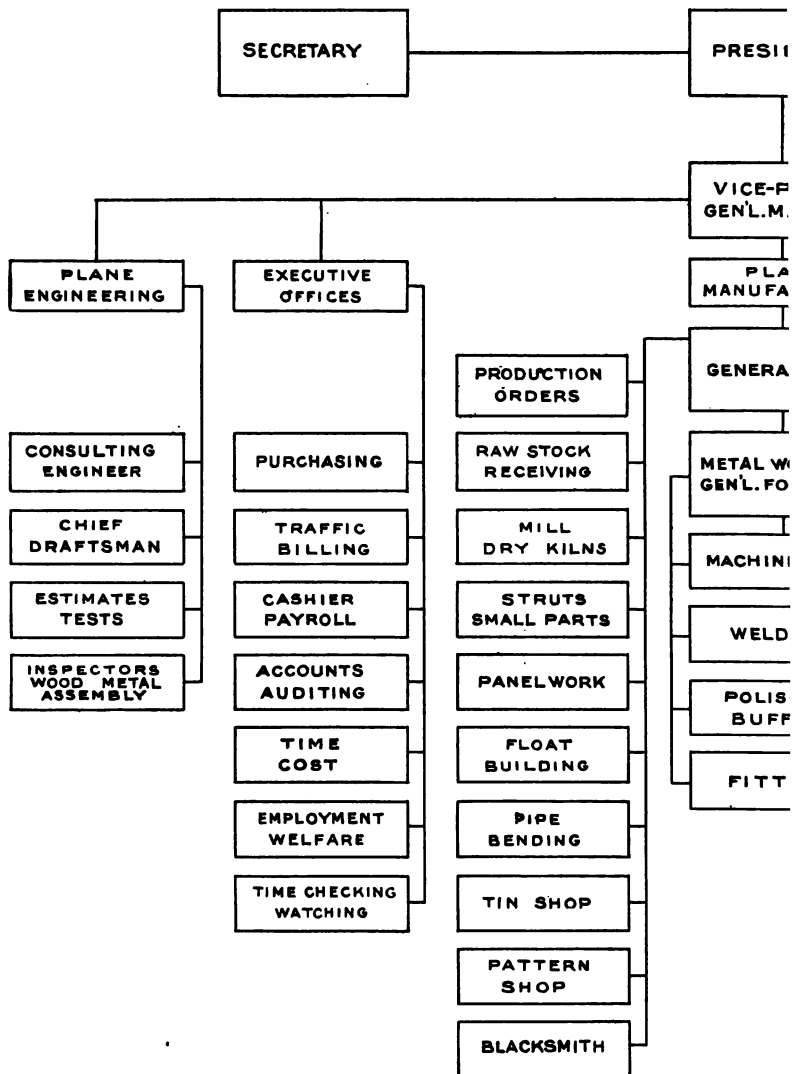
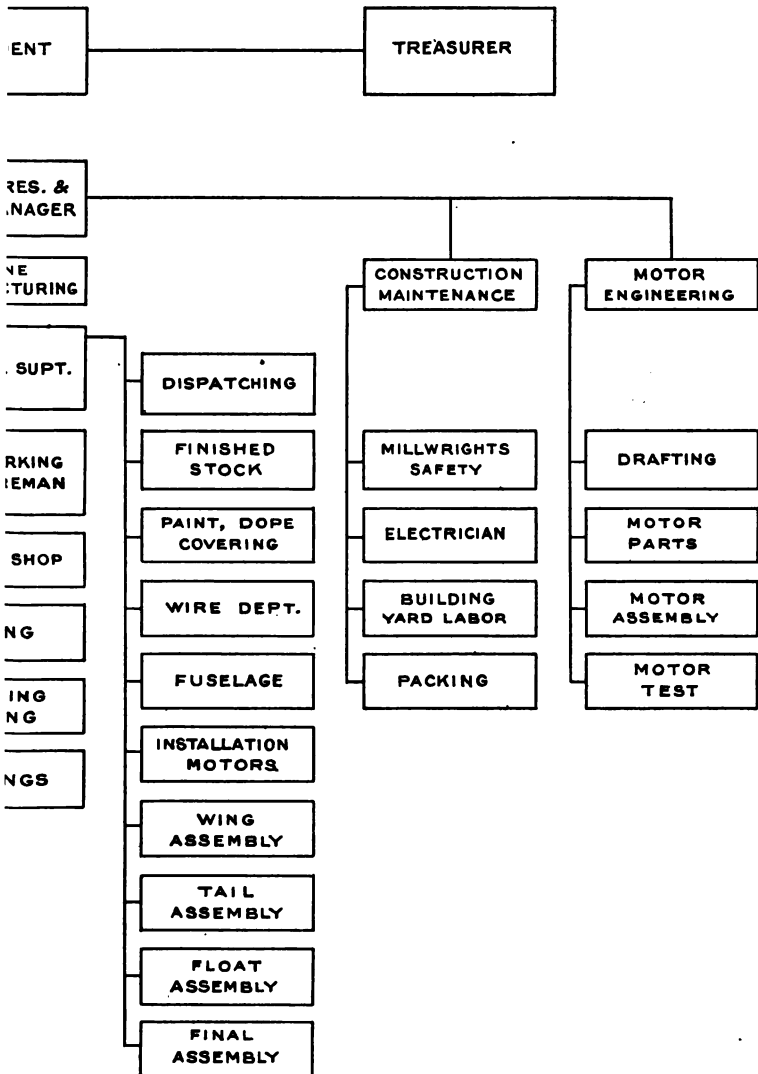


FIG. 9.—ORGANIZATION OF A PLANT ENGAGED IN MAKING



3 SEAPLANES FOR THE UNITED STATES GOVERNMENT

plying to a large proportion of the employees, that in addition to the day-work accounting on plant maintenance and betterments the determining of the direct cost of a very varied product is a simple matter. It is needless to maintain a clerical staff large enough to cost every recurring order for each part. Mass costing is found in this system to be more accurate than that carried out continuously in great detail, but the time and quantity are accumulated for every order and every part is costed by selection at intervals. *Costing*

Every standard unit is, of course, modified when new methods permit of cost reduction and the operation expense is very closely recorded and studied. The perpetual inventories are represented in the accounting department by similar cash values. The books of the plant are closed monthly and a full statement of balances, of finished product, costs, and of profit and loss, is issued early in the succeeding month.

In concluding this description of a system which solves the administration problems of a typewriter works, some references may be made to several social features.

The *Works Bulletin*, a monthly periodical by the manager, is issued to the foremen and assistants with news likely to interest and encourage them, with judicious criticism or

appreciation of departmental performances and with full acknowledgment and a detailed list of all "Good Suggestions" adopted during the previous month and the names of the contributing foremen. Much rivalry is aroused, and each issue contains from fifty to one hundred and fifty accepted suggestions of considerable value. In advancing a foreman, his record in this respect is considered in addition to executive ability.

Industrial Betterments

A suggestion system separate from that of the foremen is conducted for employees, and a prize of not less than \$20 in gold is awarded for each accepted suggestion or group of suggestions. The ordinary employees are not nearly so fruitful in suggestions of value as the foremen, but the door for them is kept wide open and all necessary privacy for this purpose is afforded.

A well-equipped club house and recreation park, honor badges for long and efficient service, a works band, a baseball league and a field day are some of the other social institutions.

The policy of the management has been merely to provide such facilities as are not available from public enterprise in a small community and not within the means of the employees, all the projects mentioned being

otherwise wholly managed and financed by the workers themselves.

As a result of the organization and the system followed, a very compact industrial unit is obtained occupying less than 300,000 square feet of floor area with its manufacturing operations and covering with its buildings and yards a rectangular plot of land only 1000 feet long by 250 feet wide. There is no waste or unused space anywhere within the various buildings or yards, and the time occupied in mere handling, or transportation of work in process, is cut down to a minimum owing to the ordered sequence of the operations, their close proximity and the rapid flow of the stock.

Extent of the Works

The building contains 1600 machine tools operated by mechanical power and 60 operated by hand labor, besides a large quantity of finely-made and costly jigs, tools and fixtures and other labor-saving equipment. Many of the machines have been specially designed and constructed at the works. The greater portion, however, are standard machine tools with slight adaptations for repetition operation by straight piece-work under studied conditions which enable them to be used on an intensive scale not attempted in ordinary engineering. The automatic screw

machines, for instance, 160 in number, are all run on a piece-work system under close inspection and the ordinary, somewhat indifferent, day operator of a group of machines has been transformed into a busy and vigilant opponent of idle spindles.

To indicate how carefully the manufacturing problem is analyzed and the methods of attacking it systematized, Tables A and B on pages 135 and 136 are reproduced. Such analysis and classification of procedure may be used in attacking any task of management.

CONDITIONS TO BE FULFILLED FOR EVERY PART BEFORE BEGINNING ITS MANUFACTURE

1. Part to be designed with quick and economical moulding, machining and assembling in view.
2. Efficient tools, jigs and fixtures, working to practical limits in dimensions and fits, to be designed, made and properly maintained.
3. The prescribed quality of work, neither more nor less, to be attained.
4. Efficient parts inspection service to be provided, securing in every department adherence to the prescribed limits and the earliest possible rejection of all defective unit parts.
5. Shop routings to be adopted in each machine and other departments which will produce the fitting surfaces in the condition permitting "least work" in assembling.
The total abolition of the file or other cutting tools at the bench is to be aimed at.
6. The classes of labor available are to be properly selected, graded and trained for the task.
7. The highest speed of assembly is to be arranged for.
8. The division of labor upon the task is to be as large as possible.
9. Care is to be taken that the preliminary time and method tests by the skilled demonstrators are carried out thoroughly, including the elimination of lost motion and full criticism of the condition and suitability for assembly of the machined unit pieces.
10. The efficiency of the machine tool and other mechanical facilities provided by the management for aiding the work of preparing, machining or assembling parts should be freely criticised.

TABLE A

CONDITIONS TO BE DETERMINED FOR AN ASSEMBLY TASK BY THE MOTION-STUDY DEPARTMENT BEFORE REPORTING SPEED POSSIBILITIES FOR RATE-FIXING ON NEW PIECE OR NEW METHOD

1. Criticism of all previous operations having been given in detail as in Table A, the following conditions are to be determined, the motions being carefully studied as to their necessity and timed as to their duration.
2. Determine best height and position of seat or chair for the operator (male or female) at the bench or machine.
3. Determine best position in front, or on right or left of operator, of the several bench tools of each unit piece comprised in the assembly task.
4. Determine best position of the hand tools and apparatus which the operator has to pick up, apply and lay down again.
5. Determine the advantage, if any, which an ambidextrous operator will have at any stage and arrange for the cultivation of that faculty.
6. Determine the best arrangement for bringing forward and removing the work without interrupting the assembly process.
7. Make progressive time studies for each of the movements decided upon as necessary under the best conditions as above determined and combine them on the principle of "least work" with proper allowance for rest periods and avoidance of undue fatigue.

TABLE B

XI

The Future of Good Team Leaders

THE future of good team leaders is wrapped up in the future of American industry. Growth in industry demands an increase in the number of foremen, shop executives and industrial managers. Increasing the rate of the world's production inevitably calls for an increase in the personnel which directs this production. And the demand is not only for more production men, but for production men of a higher grade—trained, broad-minded, competent. The New Industrial Age upon which we are entering may well be called the Era of the Production Man.

There seems to be little room for doubt that the ten or twenty years following the war will witness a remarkable increase in manufacturing and other industries.

The requirements of war called for intensive effort, concentrated

*Demands of the
Reconstruction*

upon those lines of activity which would help win the war. The requirements of the reconstruction now upon us call for a vast variety of effort.

All the peace-time demands of civilization are revived, but immensely multiplied in extent and urgency. It will take years to satisfy the hunger of the war-pinched peoples of the world—not only their hunger for necessities, but also for those conveniences, comforts and luxuries which modern trade and industry have added to the enjoyment of life. Not only are there ruined regions to be restored, wrecked bridges, broken railroads, demolished factories, ruined houses, whole cities and towns to be rebuilt and restocked, but peoples have been liberated and new trading opportunities created as a result of the war. All these conditions mean an increasing demand upon factories that can produce the goods which the world calls for.

The men who operate and manage these factories will assume a new importance in the new era. We know how vital industrial management was in the war emergency. Factories discovered then that the old policy of let-alone, of depending on chance and providence to provide them with capable leaders, was wasteful both of money and of men. The policy of careful selection and intensive training in fundamentals was established, and under this policy many a man of quick mind and positive character was rapidly developed into a highly-valued shop executive. These

men are typical of the good team leadership which made industry such a vital arm of the nation in winning the war, and which will meet the new and larger demands of the reconstruction.

What is the good team leader? He is not necessarily a technical expert, though such knowledge is valuable. The engineer-in-chief of a large modern industrial undertaking, requiring the combined efforts of civil, mechanical and electrical engineers and a big army of labor, found that where one of his foremen and higher executives failed for lack of technical training, nine disappointed his expectations for other reasons. Some failed through inability to discipline themselves; they lacked the right character balance. Others lacked adaptability and control, and were failures as executives; their personalities were one-sided. Others failed through ignorance of fundamentals, though in technical details or in some speciality their grasp was frequently far above the average; the trouble with this last group was that their knowledge was one-sided.

*Technical
Knowledge
not Enough*

When that engineer came to analyze the requirements which he found essential to success in his undertaking, he found that they were the same twelve qualifications enumer-

ated in the first Unit of this Course—the twelve traits upon which you tested yourself in the beginning. Weakness or indifference to any one of these points is dangerous, as the engineer proved to his satisfaction in several cases of men who seemed promising enough in the beginning but were too careless or too self-satisfied to take note of their own weak-spots.

The good team leader, then, is an all-round man. He has good health and strong endurance; he is physically fit. His character is well-rounded; he is loyal, he is fair, he is tactful, and has those other character traits enumerated in Unit 1. His mind is developed, alert, and under control; he has good powers of observation, concentration and judgment. Moreover, his knowledge of business is well-rounded. He knows how modern industry is organized, equipped, managed; he knows the principles of handling men and securing productive cooperation.

*The Good Team
Leader is an
All-round Man*

The main purpose of the texts of the Course is to give this well-rounded knowledge of production methods. Many a foreman or under-executive, as he studies the principles of organization in Unit III, the principles of plant layout and machinery selection in Unit IV, the various methods of cost accounting

as outlined in Unit V, and the fundamental principles of industrial management as discussed in this Unit, might well inquire: What have I to do with these things? It's not my job to determine the organization, lay out the plant and machinery, set up the cost system, or decide on the type of management.

It may not be his present job to do these things, but the future of good team leaders is bright with the promise that he may be doing these things a few years hence—if *he knows them*. He can never qualify as an organizer and manager, until he knows the principles of organization and management. Moreover, as earlier Units have pointed out, his present usefulness is considerably handicapped by ignorance of the broad fundamentals of industry. If he is to climb at all, if he is to qualify as a good foreman, a good shop executive in any capacity, he must know the fundamentals.

The case parallels very closely that of the athletic team. Each team-member knows the game thoroughly. He may not be called upon to perform every play; there may be certain functions in which his skill makes him a specialist; but he knows the game. And he plays his part of it efficiently because of this knowledge.

Knowing the Game

The good foreman, the good stores manager,

the good purchasing agent, the good factory executive in every capacity must know the game of production if he would play his part in it successfully.

There is a further reason why knowledge of production methods is essential to the good team leader. It is this: *Well-rounded knowl-*

*Getting the
Right Attitude*

*edge of industry gives him the right
attitude toward industry.* Much

of the friction between employers and employees, much of the waste which comes with industrial strife can be charged up to one account—ignorance. Because men misunderstand they come to clash, and strikes, lockouts, blacklists are born, not so much of wilful injustice and unfairness, as of ignorance of the real facts. Confidence is born of understanding.

The purpose of this Course therefore has been to give a clear and comprehensive understanding of modern production methods—to show how the wheels go round, and make clear the business reasons which underlie and control all systems and methods and policies. Out of such understanding comes the right attitude—the attitude of the team-member. For no man can be a leader until he recognizes his position as a member of his team. The sense of cooperation, of interdependence, of loyalty to the group or organization or

plant—these are the results of the right attitude toward industry, of the right understanding of industry.

For men with this attitude and understanding, the future holds out rewards that can scarcely be overestimated. Industry everywhere is calling for the man of all-round training, the man who can get along with men, who knows the production field, and who can put his knowledge into practise in harmonious cooperation with other men. Such a man illustrates the type of good team leader. There cannot be too many of him in the period of the reconstruction. He is an essential of the first-class, and he will find his contribution to the world's industry not only a vital factor in the reconstruction, but also profitable to himself. Good earnings and rapid promotion await such a man, as by mastering his present job he prepares himself progressively for the places higher up.

QUIZ QUESTIONS

I

- 1. What is organization?**
- 2. What is management?**
- 3. What is system?**

II

- 4. What is the basic reason for business organization?**
- 5. What is the Divisional plan of organization?**
- 6. What is the Departmental plan of organization?**
- 7. Why should the human factors have precedence in any comprehensive treatment of business management?**
- 8. Name the seven fundamental principles followed in good organization?**

III

- 9. What two functions are embraced in management?**
- 10. What is meant by inceptions?**
- 11. Why is it necessary to revise the organization from time to time?**
- 12. What is meant by the "scientific method" in management?**
- 13. What policy of labor management is suggested in the chapter?**

IV

- 14. Explain the relation of system to organization and management.**
- 15. What three basic points should every man in industry know with respect to his work?**
- 16. What is meant by the statement that a system should pay its own way?**

17. Name three sources from which good system work is derived.

18. Explain the two-fold remedy for unwise systematizing.

V

19. What factors determine the type of management to be adopted by a plant?

20. What is meant by the line type of management?

21. What is meant by the functional or staff type of management?

22. Name three objections which have been noted against the Taylor system of full functional management.

23. Name and explain the five principles which form the basis of the new view of industry.

24. What are the functions of a planning department?

VI

25. What are (a) stores issues, (b) tool lists, (c) work tickets, (d) instruction cards? How do these aid in putting work through the factory?

26. Explain how the lot system is operated.

27. Explain how the continuous-flow system works.

28. Outline a good policy to pursue with respect to spoilage and repairs.

29. What is salvage?

30. What is meant by stock and production control?

31. Name four classes of material which come under stock control.

32. Outline a requisition system for raw-stock control.

33. What three additional factors (besides stock control) are involved in efficient control of production?

34. What records are needed by the factory dispatcher?

VII

35. In the "Duties of Foremen" given in this chapter, what four groupings of duties are required under the heading "Production"?

36. What are the foremen's duties with respect to inspection?

37. What are the foremen's duties with respect to claims?

38. What are the foremen's duties with respect to engineering assistance?

39. What are the foremen's duties with respect to tools and machines?

40. What are the foremen's duties with respect to transportation?

41. What are the foremen's duties with respect to (a) labor, (b) wages, (c) safety and hospital, (d) fire apparatus, (e) service?

VIII

42. What is meant by "the spirit of the age"? How does it affect industry?

43. What is conservation? How does it affect industry?

44. How is the safety movement an example of industrial conservation?

45. How does the human factor enter into the movement for accident prevention?

46. In what way can advantage be taken of habit in promoting safety work?

47. What type of men would be selected for places on safety committees?

48. In what ways does the safety movement pay?

IX

49. What two personal factors should affect a workman's earnings? Which of these factors is frequently ignored in actual industrial practise?

50. Name the five primary steps involved in the wage problem.

51. Why should the output possibilities of a day's work be considered apart from the question of rating?

52. What five considerations are involved in the right settlement of the wage problem?

X

53. Sketch a rough outline of the organization described in this chapter.

54. How is the production controlled in the typewriter factory described?

55. What part in the planning have the following: (1) works engineer, (2) design engineer, (3) foremen and motion-study department, (4) inspection department, (5) manager?

56. What is the place of the foremen in this organization?

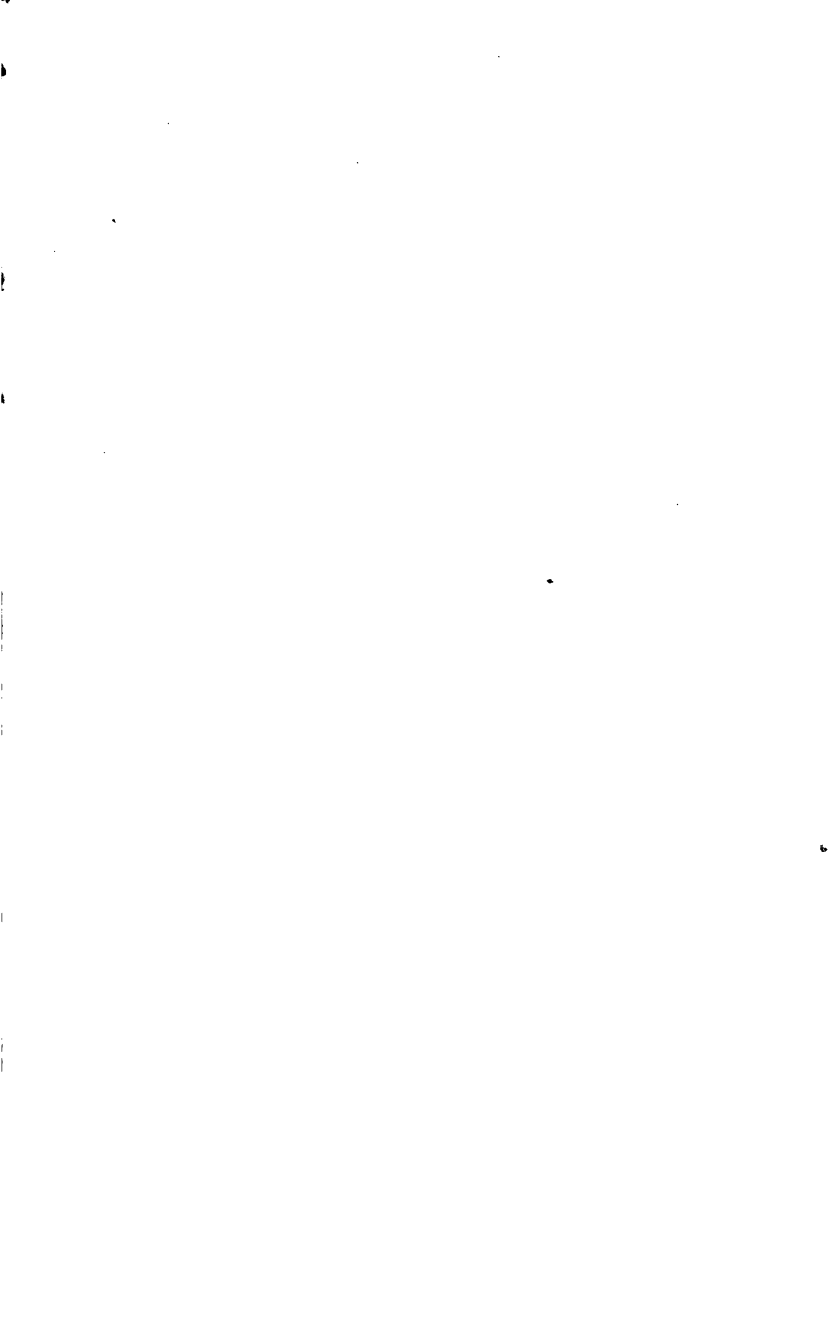
XI

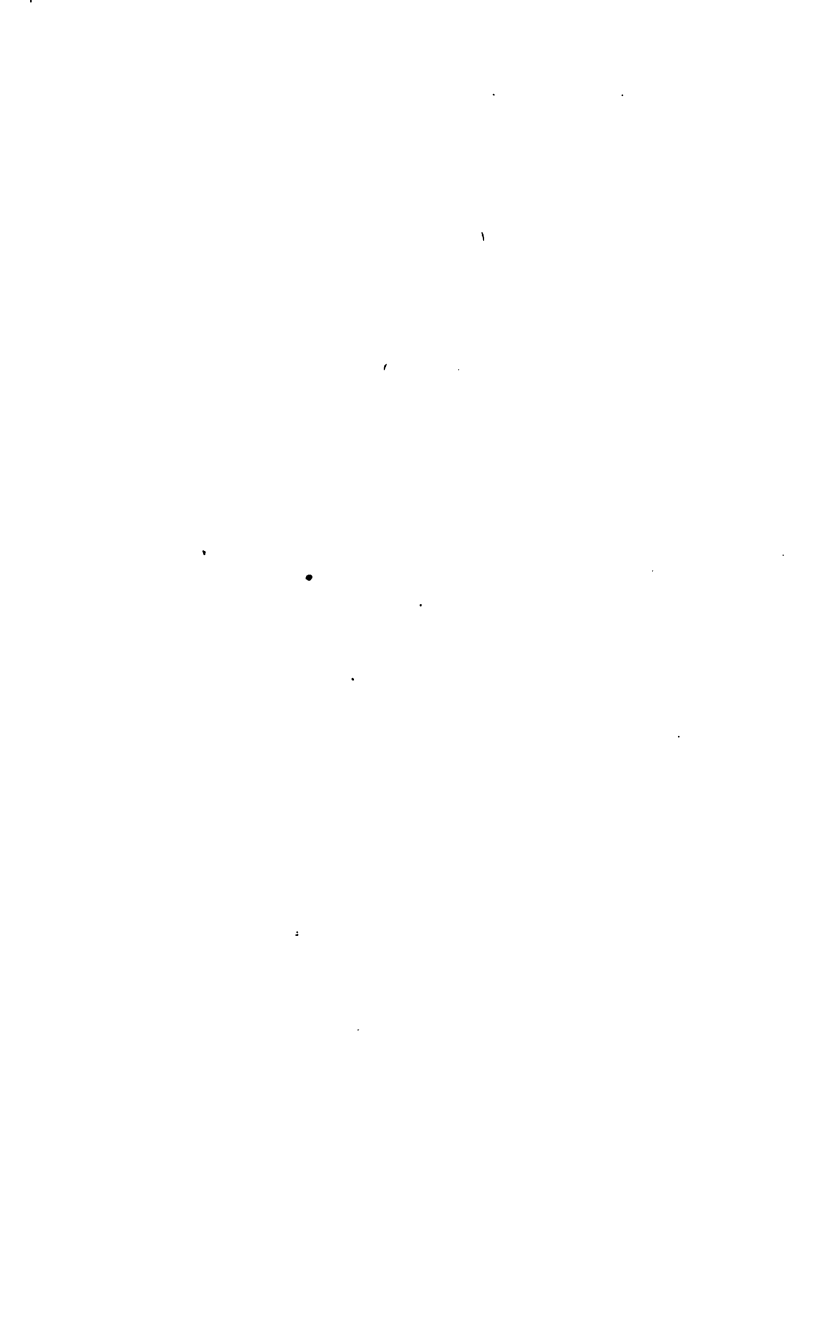
57. What reasons are there for expecting a continuing strong demand for good industrial leaders?

58. What is meant by a good team leader in industry?

59. Why should the team leader have broad knowledge of industrial principles and methods?

60. What is the right attitude toward industry?









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